Employment Projections Technical Paper 3

Employment Growth and Distribution

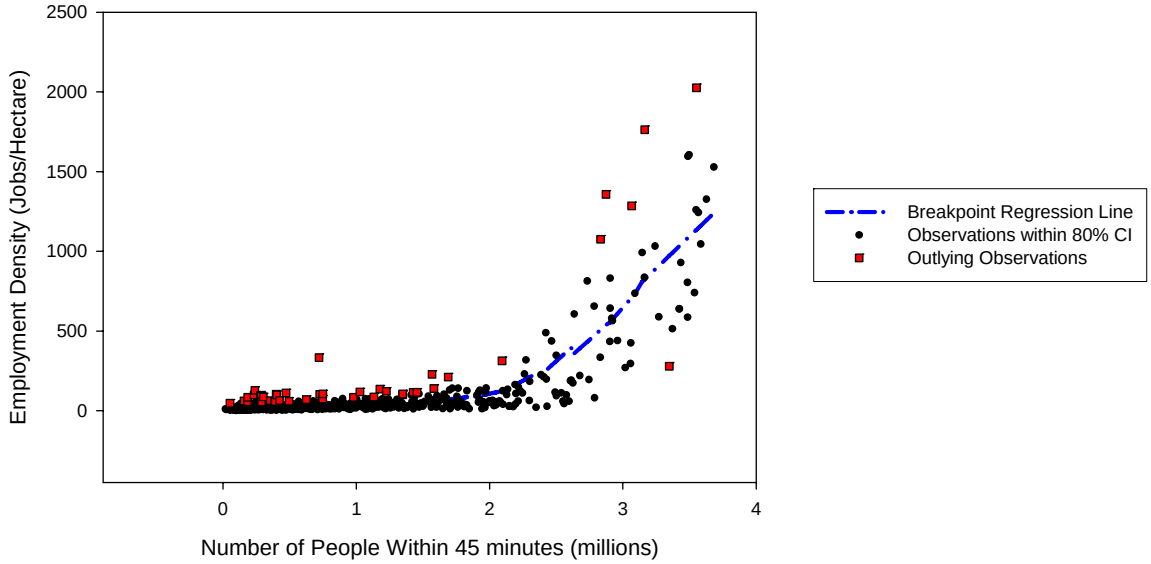
Colin Buchanan and Partners

Contents

Executive Summary

This report describes how the distribution and level of future employment growth in London might vary with alternative scenarios of future transport infrastructure. The work is based on earlier analysis that identified a clear relationship between a particular location's accessibility and its employment density. Figure E1 plots the relationship between accessibility and employment density for each ward in London. Employment density increases slowly with accessibility improvements until a certain level of accessibility is reached whereupon the rate of increase in employment density rises significantly.

Figure E1: Employment Density against Accessibility



Source: Transport Accessibility, Case for London Technical Report 1, 2004-09-20

Six transport scenarios are tested to determine the resulting changes in accessibility. These scenarios comprise the East London Line Extension (ELLX), Thameslink 2000, Crossrail (XR), Public Private Partnership (PPP) proposed enhancements to the Underground, the combination of ELLX and Crossrail and finally, all schemes combined. This study uses 45-minute public transport isochrones (the population able to reach a given ward within 45 minutes by public transport) as the measure of accessibility.

The changes in accessibility are transformed into potential changes in employment density. This was done using a curve (as in Figure E1) but with the changes capped at very high levels of accessibility. Changes maintained the position of each ward relative to the accessibility curve. Areas that had a higher employment density than suggested by their accessibility were assumed to maintain that advantage in the future and those that have lower existing employment density are assumed to maintain that disadvantage in the future.

Employment growth and distribution

The first test looks at how a fixed amount of employment growth (541,146 jobs, which is consistent with the GLA's employment projections 2004[1]) might be distributed according to the accessibility changes derived from each of the six transport scenarios. Hence, the potential impacts are scaled to match the defined level of employment growth of 541,146 jobs. The results, divided between the five sub-regions defined within the London Plan[2], are shown in Table E1.

Table E1: Distribution of employment projections by region

Scenario	Central	East	North	South	West	TOTAL
GLA Employment projections	268,466	153,224	17,046	23,049	79,361	541,146
Thameslink 2000	262,847	130,315	36,861	81,148	29,974	541,146
Crossrail	199,388	278,828	3,286	101	59,543	541,146
PPP	320,390	95,874	33,059	9,519	82,304	541,146
ELLX & XR	192,251	283,137	6,482	6,830	52,446	541,146
All schemes	272,038	159,917	25,027	11,237	72,926	541,146

The second test calculates the absolute increase in employment potential consistent with each infrastructure scenario. The results of this test are shown in Table E2.

Table E2: Employment growth potential consistent with each scenario

Scenario	Central	East	North	South	West	TOTAL
GLA Employment projections	268,466	153,224	17,046	23,049	79,361	**541,146**
ELLX	28,481	23,473	2,123	3,109	15,029	**72,215**
Thameslink 2000	56,273	28,054	7,940	17,480	14,473	**124,219**
Crossrail	64,157	89,743	1,058	32	26,099	**181,089**
PPP	253,227	75,776	26,129	7,452	67,192	**429,776**
ELLX & XR	91,594	135,044	3,025	3,156	30,306	**263,125**
All schemes	453,874	266,801	41,756	18,717	114,842	**895,991**

Table E2 suggests that:

1. Only the 'all schemes' scenario exceeds the latest GLA Employment forecasts, and the draft London Plan, which is broadly consistent with the Mayor's Transport Strategy requires most of those schemes to be in place.
2. The PPP proposals would be consistent with the largest increases in employment potential, but focus growth in central, north and west London.
3. In broad terms, a scenario consisting of ELLX, Crossrail, and approximately 70 per cent of the PPP enhancements would be in line with the GLA forecasts for employment numbers in 2016.
4. Crossrail and ELLX are pivotal if the planned growth to East London is to be consistent with accessibility changes.

1. Introduction

1.1 Background

Colin Buchanan and Partners (CBP) were commissioned by GLA Economics to investigate how expected employment growth might be distributed according to future changes in accessibility. The work builds on research, undertaken by CBP for the Greater London Authority (GLA), about the relationship between accessibility, population density and employment density, and on further work undertaken by Volterra Consulting[3] that developed the accessibility, population density and employment density relationship and used it to forecast the impacts of the Thames Gateway Bridge on local employment and population growth.

1.2 Report structure

This report is structured as follows:

Background information about the report is provided in Section 2 which examines the accessibility-density relationship, explains the modelling approach used, outlines the calibration (cross-checking) of the model and raises some general issues associated with the model.

Section 3 applies the model to six different transport scenarios and compares the results.

Section 4 examines how changes in accessibility might be used to predict future *distribution* of employment growth. The results are compared to GLA employment projections 2004.

Section 5 uses the alternative scenarios to estimate the *level* of employment growth. The results are compared to *GLA* employment projections 2004.

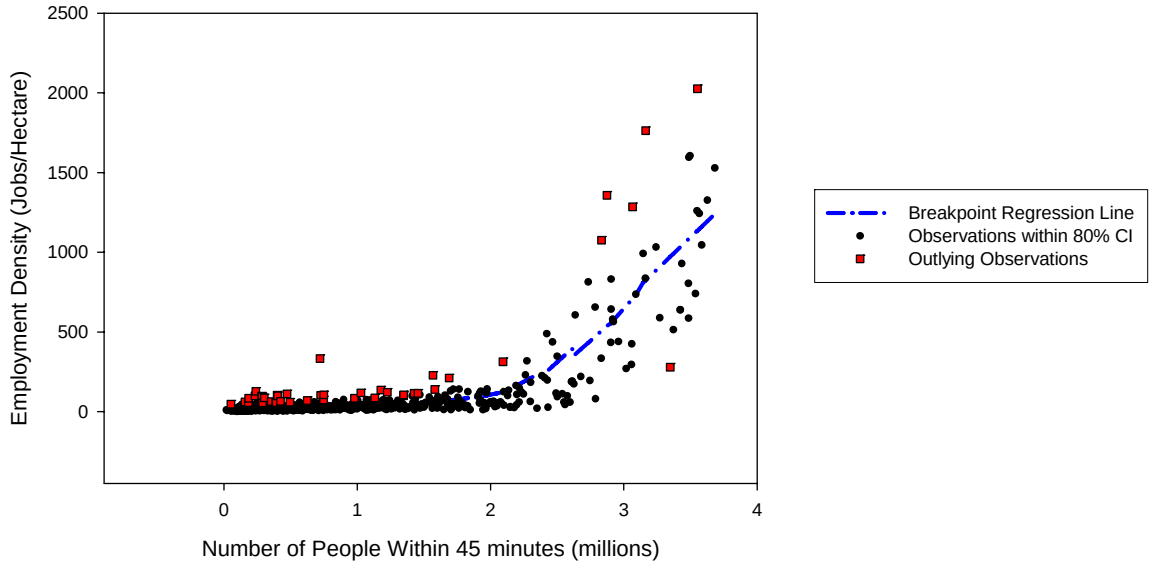
Section 6 summarises and concludes the report.

2. Background

2.1 Accessibility v employment density

Previous research[4] by CBP for GLA Economics demonstrated a clear correlation between accessibility and employment density. Figure 2.1 shows this correlation.

Figure 2.1: Accessibility and employment density in London wards



Source: Case for London Technical Report, GLA[5]

Figure 2.1 indicates that:

- At low levels of accessibility, employment density increases at a low rate. This suggests that there may be a base level of employment density that is not significantly affected by public transport accessibility.
- There is a distinct bend in the curve at higher levels of accessibility (around the two million population mark). At that point further increases in accessibility are correlated with much higher increases in employment density. These levels of accessibility, and thus of employment density, are dependent on high capacity commuter rail and underground rail services.

Additions to transport infrastructure will improve the level of accessibility of many London wards in the future (although uncertainty remains over what schemes will be implemented and when). For example, the combination of Thameslink 2000 and Crossrail would have a profound effect on the accessibility of the wards surrounding Farringdon. The journey times of many Londoners to this area would decrease significantly and the number of people in the 45-minute isochrone would increase.

If accessibility to a particular area improves, this report assumes that this will lead to an increase in employment density. This process can be explained from the perspective of a number of stakeholders:

- Companies in the key service industries seek sites with a high level of accessibility for employees, customers and others.
- Developers of commercial property favour accessible sites with the highest value.
- Planning policy encourages employment generation in sites with good public transport accessibility.
- The general public as customers and employees influence organisations by choosing to work, shop and carry out other activities at certain sites using accessibility as one of their many criteria.

However, it is important to note that the relationship between accessibility and employment density reveals nothing about the direction of causation. Accessibility changes may cause employment growth or employment growth may cause accessibility. The Isle of Dogs is an example of the complex nature of these relationships. Docklands Light Railway (DLR) is often cited as the catalyst for significant employment growth in the Isle of Dogs. But the subsequent Jubilee line extension (JLE), which services the Isle of Dogs, was perhaps built more in response to further employment growth. Recent expansion has been assisted by the additional capacity and accessibility supplied by the JLE but the relationship is complex and greatly simplified within this study.

The manner in which employment growth is distributed between different areas of London depends on a number of factors including changes in transport and thus accessibility. By modelling changes in accessibility this study calculates the expected growth in employment that a certain area can accommodate. These forecasts reflect the *potential* for employment growth in each ward. However, accessibility improvements may not translate into employment growth for several reasons:

- Planning policies protecting area characteristics may stop development.
- Demand from employers for new office space may not exist.
- Certain land use types require accessibility but do not produce high employment densities (e.g. entertainment facilities such as museums, sports facilities and cinemas).

The variety of methods used to calculate changes in employment capacity are described in Section 4. In general they depend on whether the relationship between accessibility and density is taken to be *absolute* (all zones are assumed to converge towards the curve) or *relative* (zones above the curve remain above, and zones below the curve remain below). There are then options for capping the changes in density to reduce the variations.

The modelling approach taken in this report focuses on public transport, whereas the previously mentioned CBP study included a measure of both public and private transport accessibility. This would, however, appear justified in the context of current GLA and central government transport priorities. In addition, as much of the employment growth is expected in sectors that are clustered around areas of high employment density, it is anticipated that accessibility by high capacity rail modes will have the greatest impact.

2.2 Modelling approach

The methodology underpinning this study utilises CBP's Analysis of Bus Route Accessibility (ABRA) model to recreate the existing transport network in London.

The ABRA model is based on a detailed representation of the public transport network. The network is built to include individual railway and underground stations, and bus and tram stops. The bus stop locations have been obtained from Transport for London's Computer Assisted Location and Management of Stops and Shelters (CALMS) database, which lists all the bus stops in London by geographic location.

The stops and stations are then connected by the individual bus, rail and Underground lines (including DLR and Tramlink) in the Greater London Area. The public transport routes are assigned travel times and frequencies. Suburban rail times and frequencies are all taken from 2003 timetable information. Tube and bus travel times are based on modal average speeds, and frequencies represent the July 2004 network.

The routes are connected by interchanges. Interchange penalties by mode type are coded into the model according to the ease with which an interchange can be made. For example, there is a lower interchange penalty between two rail modes than between rail and bus.

Walking time to access the network and at interchanges is based on the 'as the crow flies' distance between interchange stops and stations. The model includes ward centroids (the centre point of a ward) with average walk distances to the public transport network.

2.3 Accessibility zone system

The zone system used for the public transport accessibility calculation is based on 1991 ward boundaries. To calculate accessibility, the model searches an area within a radius of 500 metres from the centroid looking for stops and stations with which to connect to the public transport network. The generalised travel time to a chosen destination is then applied to that zone to represent accessibility.

Population and employment numbers for the base year 2001 and for predictions of 2016, derived from census data, were then applied to each zone to enable an estimate of the number of people (or jobs) within a certain travel distance from a particular point to be calculated.[6]

Employment data at ward level does not include the self-employed. Therefore, borough employment figures including the self-employed were taken, and the ward totals calculated as a proportion of the borough.

Accessibility is expressed as the sum of the population of the wards that are within a 45-minute isochrone. This has proven to be a very descriptive measure of accessibility and gave the best fit for the accessibility-density relationship in CBP's earlier research.

2.4 Running the ABRA public transport model

The model uses a calculating algorithm that identifies the shortest path through the public transport network in terms of generalised time. The model returns the shortest path for a set of routes (multi-routing).

Calibration

The ABRA model was calibrated in the base year 2001 to the London Transportation Studies (LTS) model base year results used by Volterra Consulting[7]. The LTS model calculated 45-minute travel time isochrones. Figures 2.2 and 2.3 compare the two models where Volterra Consulting's map output has been recreated using a different scale to the original report to facilitate comparison.

Figure 2.2: Calibration of ABRA to Volterra's model (based on LTS)

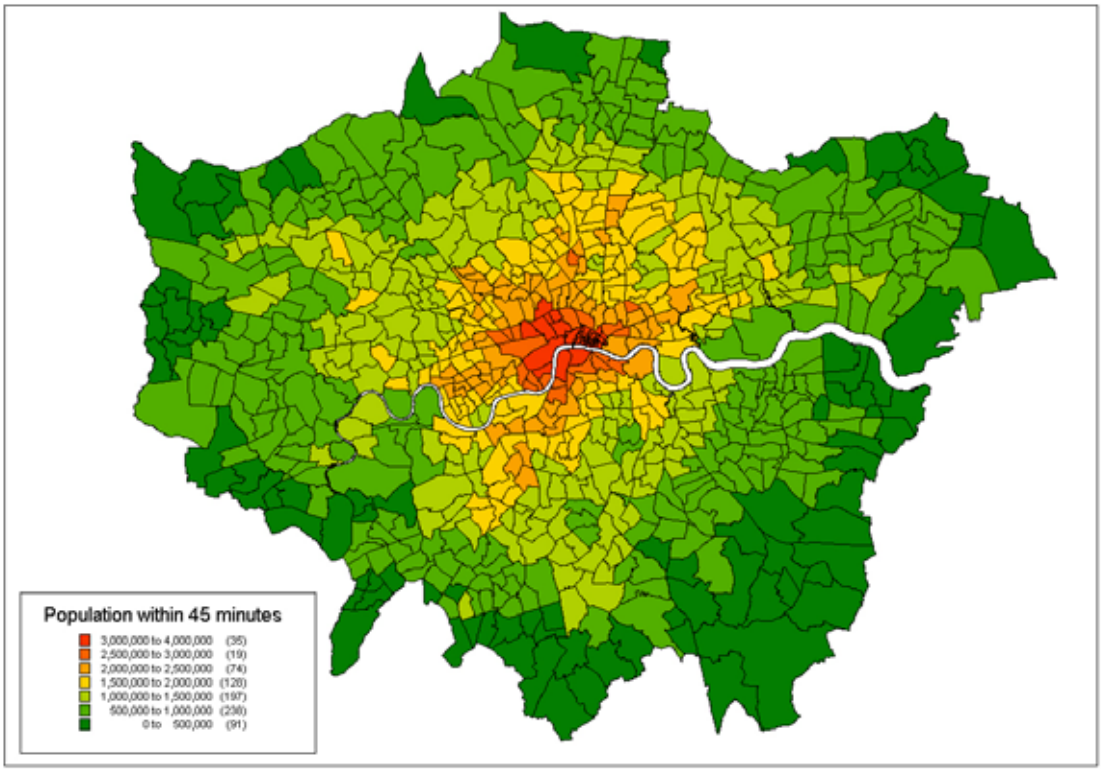
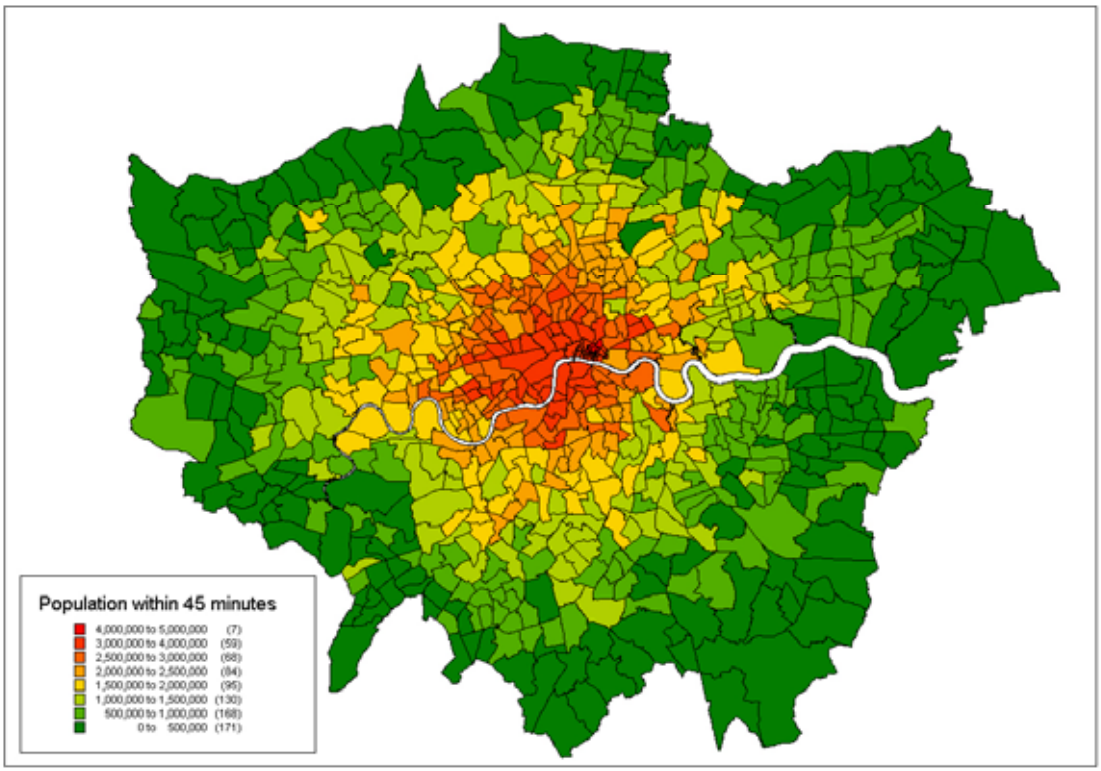


Figure 2.3: Calibration of ABRA to LTS model



Differences between the two models occur due to a number of factors. For example, both models incorporate slightly different transport networks, as many frequencies (particularly bus frequencies) have changed in recent years. More significantly, the models use a different method to connect to the public transport network from the ward, based on a 'connector'. In the end it was found that a 50-minute ABRA isochrone provided the best fit to the 45-minute dataset from the LTS model. The remainder of this study therefore uses a 50-minute ABRA isochrone which is compatible with the 45-minute LTS isochrone. The term 'population within 45 minutes' of a ward is consistently used to describe its isochrone.

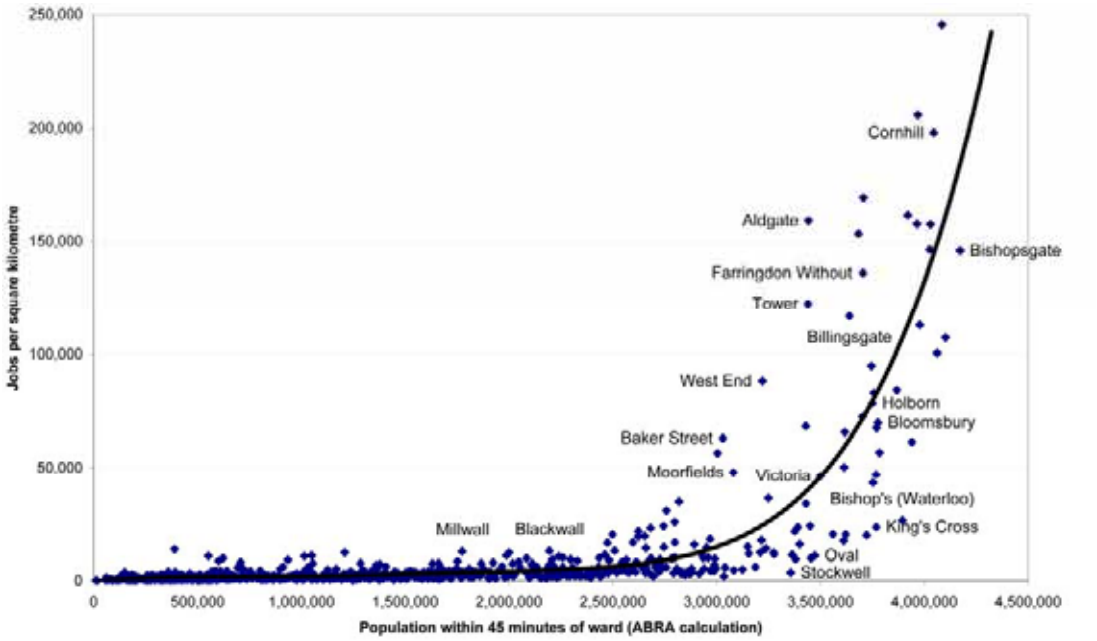
Figure 2.4 shows the accessibility-employment density curve calculated by the ABRA model from the 2001 data. In order to avoid the large effect of central London's parks on employment density in a small number of wards, the area of following parks was subtracted prior to the calculation of the employment density figures:

- St James' Park / Green Park
- Hyde Park / Kensington Gardens
- Battersea Park
- Regent's Park / Primrose Hill

Although Figure 2.4 is a reworking of the original analysis with an updated model, the shape of the curve is basically the same as that found in the earlier work and shown in

Figure 2.1. The curve has an R^2 value of 0.7451, which represents a relatively satisfactory level of correlation.

Figure 2.4: Correlation between employment density and accessibility by public transport



2.5 General Issues

There are a few general issues concerning the overall approach:

Causation

As mentioned earlier, the relationship itself reveals nothing about the direction of causation. Although Sections 4 and 5 assume that the distribution of employment growth will be determined largely by changes in accessibility, this may not be the case.

Capacity

The measure of accessibility defined as the population within 45-minutes travel time, ignores the whole issue of capacity and overcrowding. Other work undertaken by CBP (for Cross London Rail Links Ltd)[8] suggests that it is capacity constraints that are likely to restrict future employment growth within the (highly accessible) central area rather than a lack of accessibility.

Capacity issues could be modelled better using a measure of generalised time, including crowding penalties. Crowding penalties, such as those produced by the LTS model, would increase total travel generalised time to congested destinations, but they do not provide any sort of absolute constraint in the way that seems to happen in practice. The relationship between accessibility and employment density described in Figure 2.1 already includes the impact of higher crowding for trips to destinations within the central area and indeed differential crowding effects within the central area.

Employment growth

The employment growth, which forms the basis for this report, is taken from GLA Economics publication *Working Paper 11 Working London Employment Projections by Sector, November 2004*. This predicts total employment growth between 2004 and 2016 of 541,146 jobs, broadly consistent with the original *London Plan*.

Population growth

The *London Plan* predicts substantial population and employment growth. Population growth means that most areas will see a significant increase in their population catchments by 2016, even without any change in transport accessibility. The distribution of that population growth affects the extent to which different areas benefit, and interacts with changes in transport accessibility in ways that are sometimes not immediately apparent.

In order to isolate the impact of specific transport infrastructure schemes, it is necessary to calculate isochrones using 2001 population figures, thus ignoring expected future population growth. This assumption maintains the independence of the population and employment growth effects in the model. In reality these two effects are interdependent. In particular, the *London Plan* expects that most of the population growth would be within the Central and East London regions which would intensify employment growth in these two areas.

Boundary issues

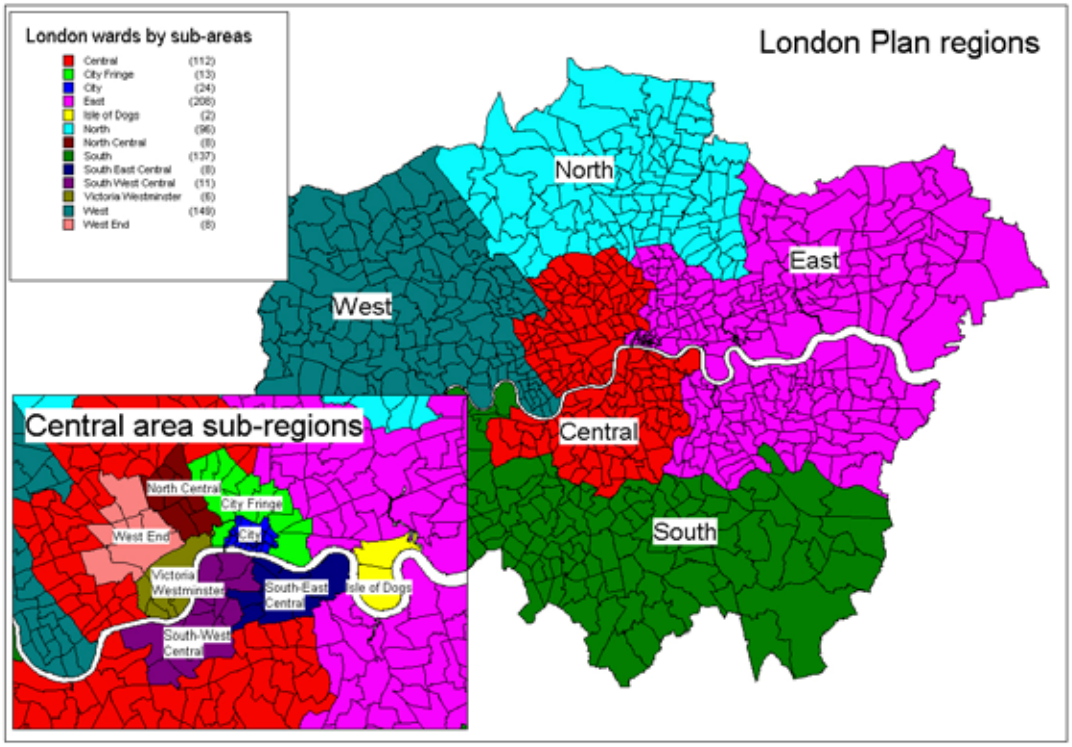
The model stops at the Greater London administrative boundary. This means that the results underestimate public transport accessibility, especially in outer London, by ignoring the population catchment area outside the greater London boundary. Although this is a weakness it does not materially affect the results because of the following:

- It is not really a significant issue for Central London, although it may underplay the impact of major schemes such as Crossrail and Thameslink.
- Outer London is much more dependent on private rather than public transport for access to employment. Public transport only has an 18 per cent public transport mode share for the journey to work in outer London[9].

2.6 Display of results

The results of the tests are displayed by sub-regions defined in the *London Plan*. In addition, Central London sub-areas have been defined to provide a suitable level of differentiation to view the central area effects. Figure 2.5 illustrates the wards by sub-regions and sub-areas.

Figure 2.5: London wards by London Plan Sub-Region and Central Area sub-areas



3. Accessibility analysis

The analysis was conducted for six different scenarios that are presented and discussed below. For each scenario, the model is used to calculate the wards that lie within 45-minutes travel time. The population of those wards are then summed to derive the total population catchment.

3.1 Scenario descriptions

The base ABRA network contains the 2004 bus and London Underground network and frequencies with 2003 suburban rail service timetables. The scenarios all include the DLR extension to Woolwich Arsenal, Cross River Transit and Greenwich Waterfront Transit, as these schemes are assumed to have been implemented. In order to produce scenarios the following adjustments have been made to the rail networks:

Scenario 1: ELLX

This scenario adds the proposed ELLX to the base network. ELLX has been included with extensions to West Croydon, Crystal Palace, Clapham Junction, and Highbury and Islington.

Scenario 2: Thameslink 2000

The latest version of the Thameslink 2000 scheme published by Network Rail has been included[10]. Peak frequency through the central section is assumed at 24 trains per hour. Journey times were calculated using an average speed of 50 km/h on the outer legs and an average speed of 30 km/h on the central section (King's Cross to London Bridge/Loughborough Junction) to reflect the higher density of stops.

Scenario 3: Crossrail

The latest published version of the Crossrail scheme (July 2004) has been included. This assumes legs to Maidenhead and Heathrow in the west, and Shenfield and Ebbsfleet in the east. Peak frequency through the central section is assumed at 24 trains per hour, and an average speed of 50 km/h is used to calculate journey times.

Scenario 4: PPP

This scenario comprises the enhancements to the London Underground network contained within the PPP contractual arrangements. The proposed improvements comprise increases in frequency, increases in speed and increases in capacity. The modelling assumes:

- A ten per cent frequency enhancement to much of the Underground network.
- Line speed increases affecting the Jubilee, Circle, Northern, Victoria, Piccadilly, Metropolitan and District lines.

Capacity changes are not relevant to calculations of 45-minutes travel time catchments and have therefore been ignored.

Scenario 5: ELLX and Crossrail

This combines the ELLX and Crossrail schemes.

Scenario 6: All schemes

This scenario combines the schemes from Scenarios 1 to 4 (PPP, ELLX, Crossrail and Thameslink 2000).

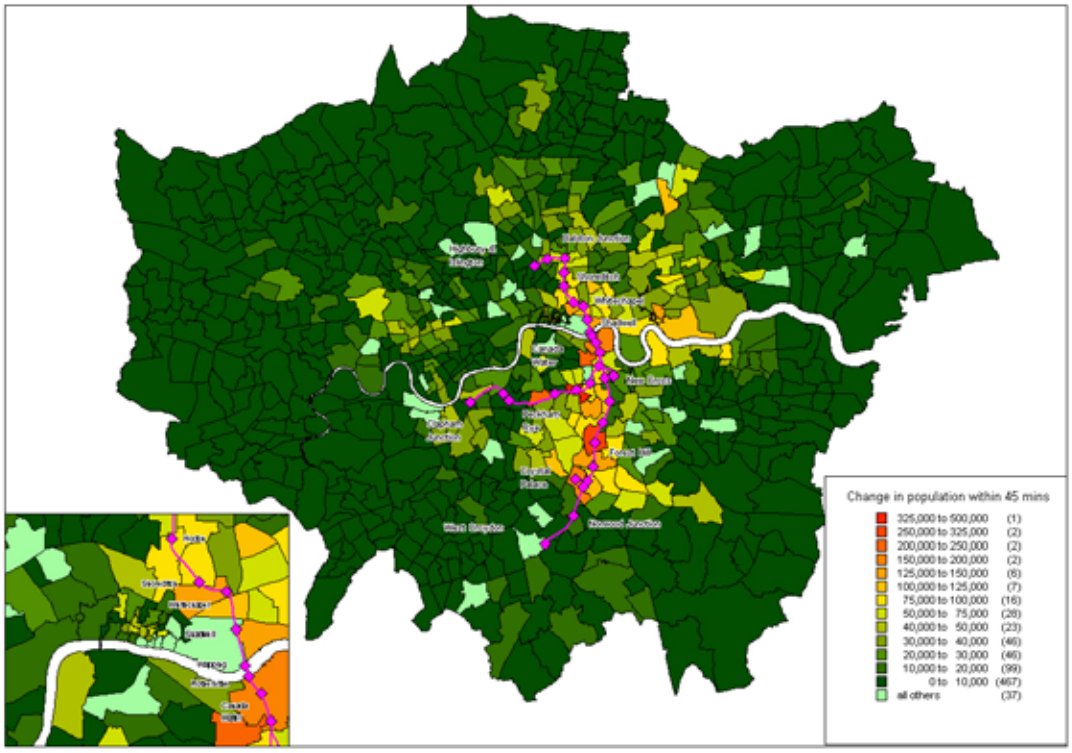
3.2 Results

Plots showing the change in accessibility to each individual ward for each of the various infrastructure scenarios are shown in Figures 3.1 to 3.6. Some brief comments on each scenario are provided below.

Scenario 1: ELLX

Figure 3.1 highlights the increase in population within the 45-minute isochrone of each ward under this scenario. The effects of ELLX are centred on its corridor, spilling over to nearby wards in East and South-East London.

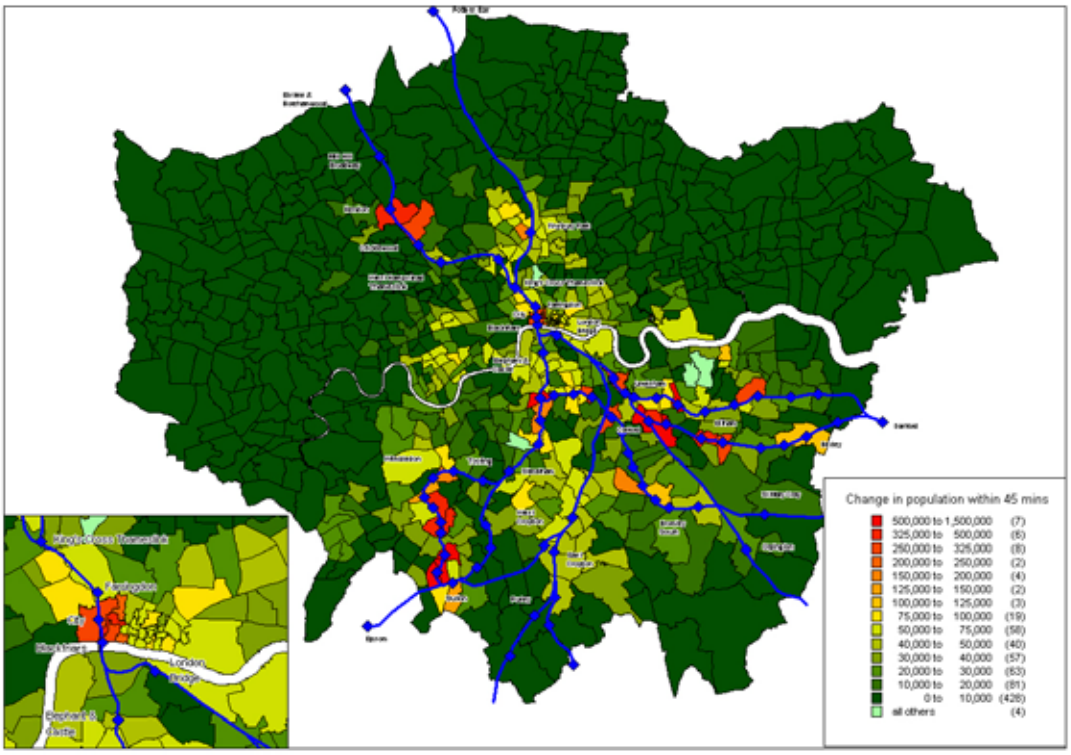
Figure 3.1: Change in 45 minute isochrone under ELLX



Scenario 2: Thameslink 2000

Figure 3.2 highlights the increase in population within the 45-minute isochrone of each ward under this scenario. The frequency increases enabled by Thameslink 2000 have their largest effect in wards with no direct tube access. Widespread accessibility increases are therefore felt in South and South-East London. Large localised increases in accessibility are experienced by wards around Hendon, Cricklewood and Finsbury Park in the north. The improved links and frequency on the Tooting-Wimbledon-Sutton loop have a moderate impact on other corridors in South and West London. The sum of these effects obviously leads to accessibility increases in Central London. It should be noted that to the north, some of the benefits of Thameslink accrue outside Greater London. Those benefits are not captured within this analysis as the model stops at the Greater London boundary.

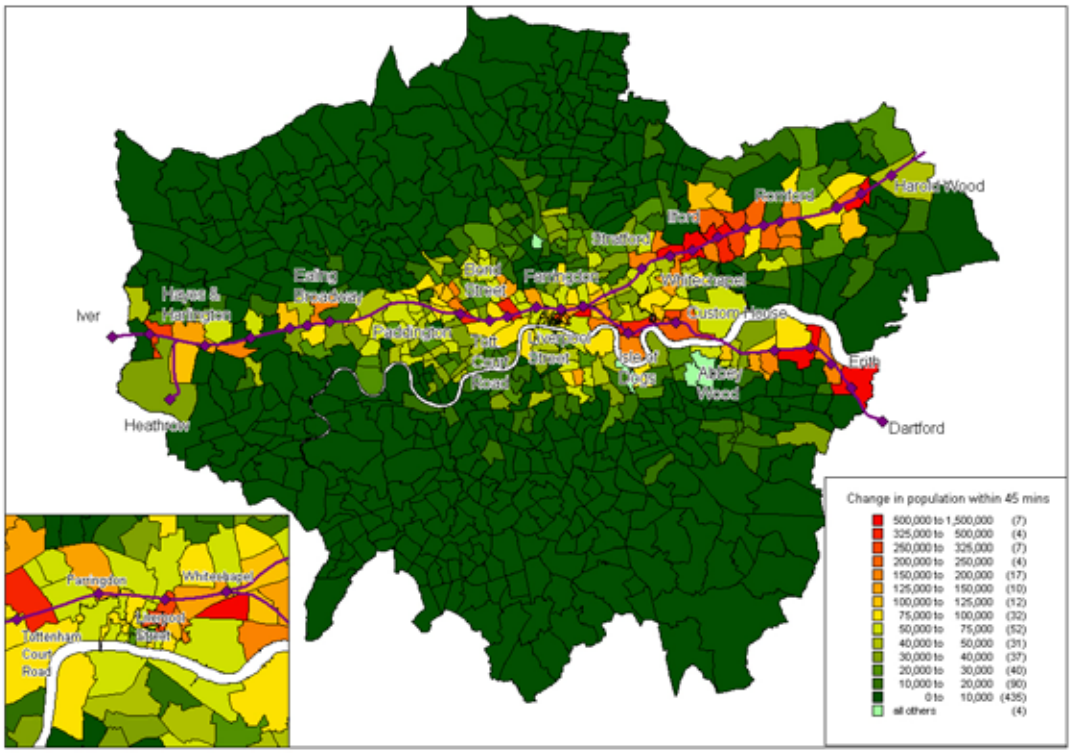
Figure 3.2: Change in 45 minute isochrone under Thameslink 2000



Scenario 3: Crossrail

Figure 3.3 highlights the increase in population within the 45-minute isochrone of each ward under this scenario. Crossrail provides a significant increase in accessibility for the entire corridor. Some other corridors with a good interchange to Crossrail receive a more moderate increase in accessibility under this scenario. The impact of Crossrail is visibly larger to the east than the west. In part this is because of the new alignment to the south east and partly because of the lower base level of accessibility.

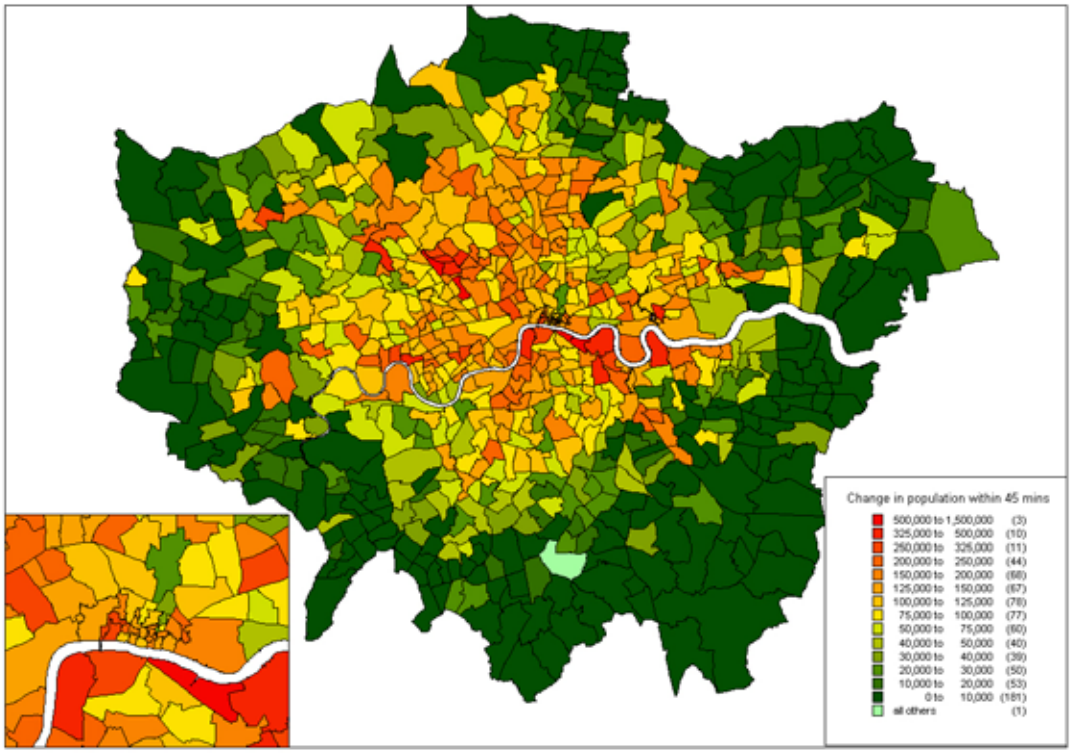
Figure 3.3: Change in 45 minute isochrone under Crossrail



Scenario 4: PPP

The PPP scenario produces large increases in accessibility across much of London as shown in Figure 3.4. This scenario assumes that all of the proposed improvements to the Underground network are completed. The accessibility improvements clearly follow the areas covered by the Underground network, with Central, North and West London gaining the largest benefits and South and East London the least.

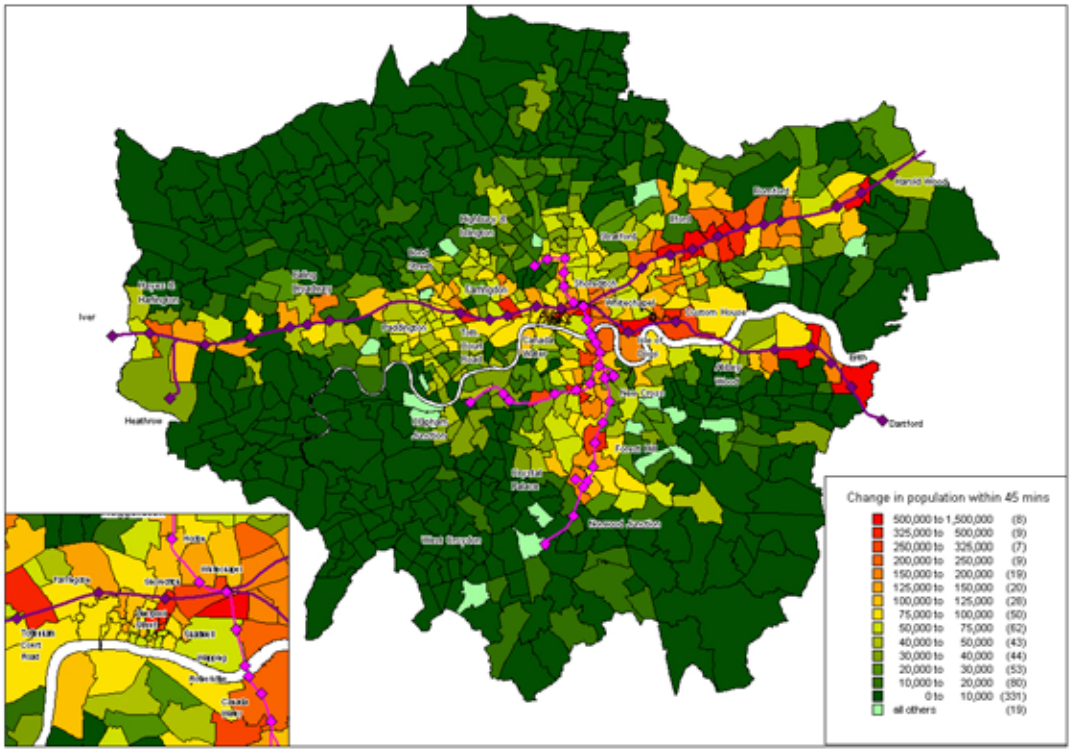
Figure 3.4: Change in 45 minute isochrone under PPP



Scenario 5: Crossrail and ELLX

As shown in Figure 3.5, the combination of Crossrail and ELLX shifts the centre of accessibility improvements to the east. While benefits are spread across broad areas of London (due to the connections and interchanges available within the public transport network) the focus is very clearly to the east of the City with the ELLX alignment down to Croydon in the south clearly visible.

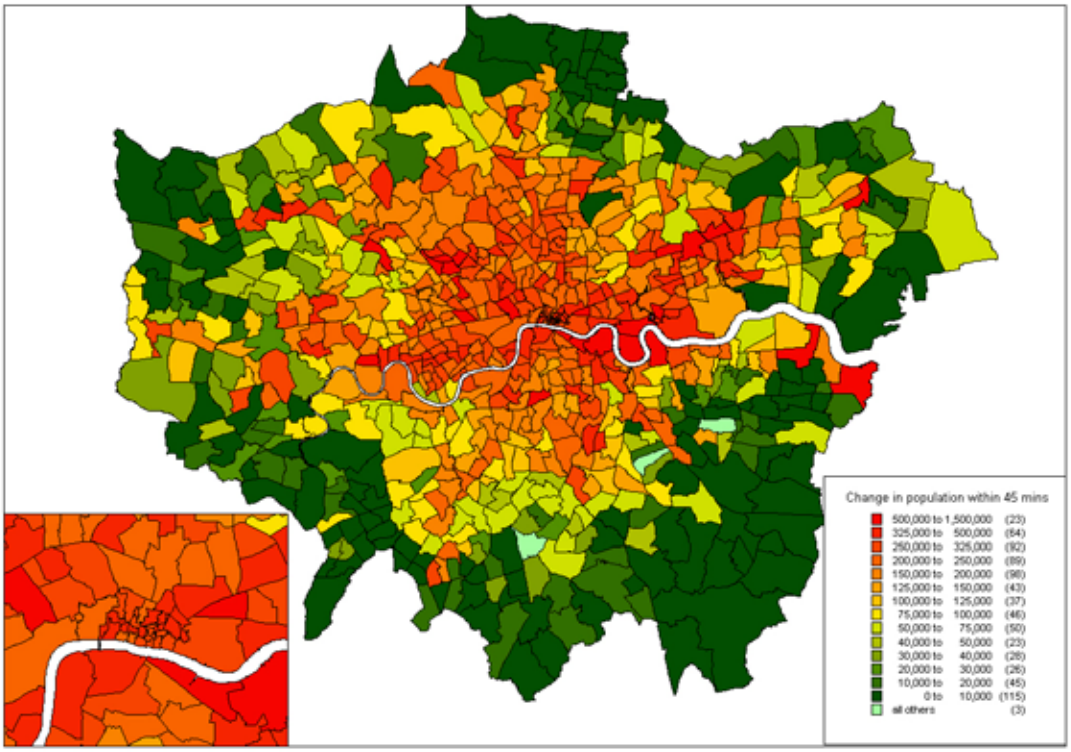
Figure 3.5: Change in 45 minute isochrone under Crossrail and ELLX



Scenario 6: All schemes

Figure 3.6 highlights the increase in population within the 45-minute isochrone of each ward under this scenario. South-East London gains significant benefits, as does the eastern fringe of the City and the Docklands area. In general terms, it can be stated that the accessibility impacts cover most of inner London. In outer London, more localised impacts can be observed in wards with direct access to the affected rail and tube networks.

Figure 3.6: Change in 45 minute isochrone under all schemes



3.3 Comment

The ABRA model provides a good indication of the changes in accessibility that will be experienced by wards under the examined infrastructure scenarios. Major new rail infrastructure, such as ELLX or Crossrail, generally has an accessibility impact on the corridor itself and on small spurs of connecting corridors. The effects of the PPP improvements on the other hand are expected to be more widespread covering much of the Underground network.

4. Implications for employment distribution

4.1 Approaches

The previous section described the changes in the population catchment areas resulting from the proposed improvements to the public transport network. This section looks at how those changes in accessibility might be used to predict the future distribution of employment growth. In doing this, it is recognised that a scenario based purely on accessibility changes will be just as wrong as a simple extrapolation of past trends or a scenario based on planning policies and/or aspirations. This approach, therefore, should provide one extreme outcome that when combined with alternative approaches, helps define a sensible range of possible outcomes.

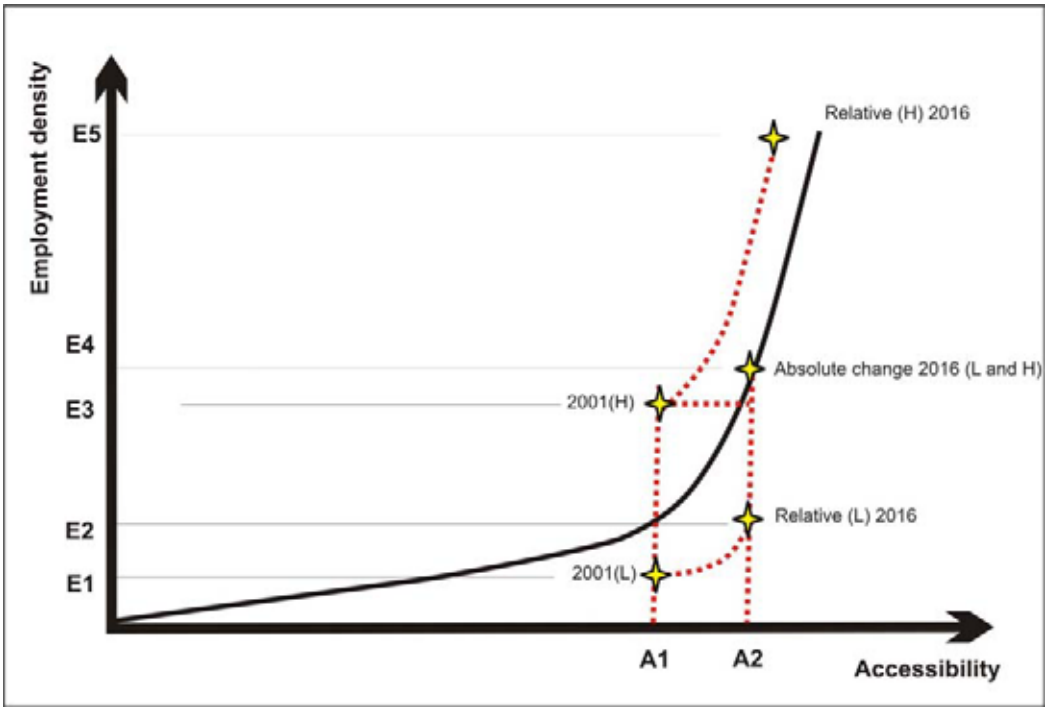
The absolute and relative approaches were tried initially. The *absolute* approach assumes that over the (medium-term) period of the *London Plan* all wards will converge towards the accessibility-density relationship described in Section 2. Wards that currently have higher employment density than predicted by the curve (e.g. Aldgate, Baker St) may see reductions in employment density even if accessibility improves. Wards that are currently below the curve (e.g. King's Cross, Bishops [Waterloo]) will see significant increases.

The *relative* approach, by contrast, assumes that wards that are above or below the curve are there for good and enduring reasons. Thus a ward which has employment density ten per cent below what would be expected by the curve continues to be ten per cent lower irrespective of changes in accessibility. The two approaches are illustrated in Figure 4.1.

Figure 4.1 shows two wards, one 'above the curve' (with an employment density higher than can be explained purely by accessibility) which starts at point 2001 (H) with accessibility A1 and employment density E3, and one 'below the curve' which starts at 2001 (L) also with accessibility A1 but with employment density E1. Both wards have an identical level of accessibility in 2001 (A1) and both benefit by the same increase in accessibility by 2016 shown by the move along the horizontal axis to point A2. The *relative* and *absolute* approaches have very different effects however. Taking (L) the *relative* approach moves the ward parallel to the curve increasing employment density from E1 to E2. The *absolute* approach however shows the employment density increasing such that it moves up to 'Absolute Change 2016' at density E4. For wards that start 'below the curve' the *absolute* approach gives higher increases in employment density.

For wards starting 'above the curve' the opposite is true. Using the *absolute* approach in this instance gives a small increase in employment (from E3 to E4), but the *relative* approach gives a much larger increase (from E3 to E5).

Figure 4.1 Absolute and relative change



There are strengths and weaknesses of each approach. The *absolute* approach is clearly wrong as there will be wards where employment is permanently lower or higher than expected. Reasons for this are likely to include the presence of significant amounts of green space, planning restrictions both on land use and development density, agglomeration benefits derived from higher densities, and proximity to pull (e.g. airports) and push (e.g. power stations) factors. Local image or reputation must also exert a considerable influence; there remains a certain cachet to having an address in the City and indeed north rather than south of the river.

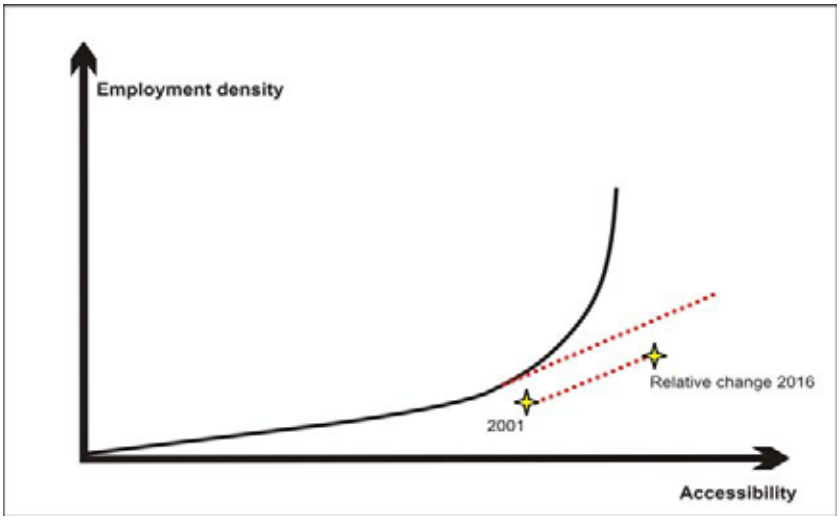
On the other hand the reasons behind the relative underdevelopment of certain areas do not always last. Paddington has recently seen a surge of development and other main line rail nodes such as Waterloo, King's Cross and Stratford all seem likely to benefit from significant development in the short to medium term. The factors that reduced development around many rail terminals (environmental pollution, poor image, railway ownership of large tracts of land, and dominance of intercity rather than commuting services into King's Cross and Paddington until relatively recently) and placed them all substantially below the curve, can and sometimes have been overcome.

A problem with both approaches is that they predict large overall increases in employment. That arises from the shape of the curve whereby relatively small increases in accessibility to the central wards (with high accessibility already) result in large rises in employment density. In reality, employment cannot rise by that much and so the results have been scaled back to more realistic levels. It does raise an issue about whether the curve is static or whether it shifts outwards as the City and its transport

infrastructure expands and there are actually a family of curves for different sizes of City.

The Straight Line Capped (SLC) approach was a way around that problem, based on the method adopted by Volterra Consulting in their work on the Thames Gateway. The SLC approach caps the increase in density expected at higher levels of accessibility by constraining the curve to a straight line (see Figure 4.2). SLC applies only to zones with accessibility in excess of 3.5 million and the line is taken as the average rate of increase in employment density for all wards with accessibility between 3.0 and 3.5 million.

Figure 4.2. Relative change (Straight Line Capped)



The combination of approaches and infrastructure scenarios rapidly became unmanageable so only one, the SLC approach, has been taken forward. The results for the three approaches to the distribution of employment for a single scenario (Scenario 6: All schemes) are shown in Tables 4.1 and 4.2.

Table 4.1(a): Distribution of Employment Growth by region
(all schemes)

Data	Central	East	North	South	West	TOTAL
GLA Employment projections 2004	268,466	153,224	17,046	23,049	79,361	541,146
Absolute	346,425	103,012	24,144	28,208	39,357	541,146
Relative	342,551	136,270	10,260	4,607	47,458	541,146
Straight Line Capped	274,164	161,138	25,219	11,305	69,361	541,146

Table 4.1(b) Distribution of Employment Growth

(% of GLA Employment projections 2004 all schemes)

Data	Central	East	North	South	West
GLA Employment projections 2004	100%	100%	100%	100%	100%
Absolute	129%	67%	142%	122%	50%
Relative	128%	89%	60%	20%	60%
Straight Line Capped	102%	105%	148%	49%	87%

C = Central, E = East, N = North, S = South, W = West

Table 4.2(a) shows the amount of growth expected within different parts of Central London (n.b. Central London is not the same as the Central Region taken from the *London Plan* definition). Figure 2.5 shows the geographic definitions of the Central London sub-areas and Table 4.2 (b) shows growth as a percentage of the latest *London Plan* scenario.

Table 4.2(a) : Distribution of employment growth by sub-area

Data	CF	Cit	IoD	NC	SEC	SWC	VW	WE	Total
GLA projections	74,260	39,654	27,825	38,330	6,121	22,534	32,927	46,923	288,575
Absolute	18,192	26,147	0	74,811	25,108	97,615	37,022	27,065	305,959
Relative	65,068	57,041	4,977	77,135	26,975	43,301	43,592	58,783	376,873
SL Capped	38,860	7,346	32,203	24,475	36,596	34,907	13,488	22,686	210,562

CF = City Fringe, Cit = City, IoD = Isle of Dogs, NC = North Central, SEC = South East Central, SWC = South West Central, VW = Victoria/Westminster, WE = West End

Table 4.2 (b) Distribution of employment growth (% of GLA Employment projections 2004)

	CF	Cit	IoD	NC	SEC	SWC	VW	WE	Total
GLA projections	100%	100%	100%	100%	100%	100%	100%	100%	100%
Absolute	24%	66%	0%	195%	410%	433%	112%	58%	106%
Relative	88%	144%	18%	201%	441%	192%	132%	125%	131%
SL Capped	52%	19%	116%	64%	598%	155%	41%	48%	73%

From Tables 4.1 (a) and (b) it can be seen that for the *all schemes* scenario the distribution of growth is broadly similar to the *London Plan* scenario under each of the three approaches to distribution. The absolute approach puts more growth in the Centre and less in the West and East. The relative approach puts more growth in the East and less in the North and South. The SLC approach reduces growth in the Centre and puts more in the West and East.

Looking at the sub-areas in Tables 4.2 (a) and (b) the differences become more apparent. The absolute approach puts relatively little growth in the City, City Fringe, Isle of Dogs and West End with more than half of total growth concentrated in the south of the Central area (SWC, SEC and VW). Those are the areas that are relatively underdeveloped at present, compared to the accessibility curve. The absolute approach assumes that over time their employment density will rise to match that shown by the curve and hence puts more of the growth there.

The relative approach puts more growth into those areas that already have development densities above the curve. Thus the City and City Fringe areas increase dramatically as does the proportion of total London growth taking place within the selected sub-areas (30 per cent higher than the *London Plan* scenario and 23 per cent higher than the absolute scenario).

The SLC approach results in broadly the same distribution as the *London Plan* between the main regions, a bit more in the North and a bit less in the South. As growth in the most accessible wards is capped but the rest left unchanged, there is less growth in the City and City Fringe, but more in the areas south of the river (South-East Central and South-West Central) as shown in Tables 4.2 (a) and (b). Overall growth within the sub-areas, shown in Table 4.2 (a), is considerably lower than in the relative or absolute approaches because of the capping.

There is no obviously right scenario arising from this analysis. The differences emphasise some of the uncertainties inherent within the analysis. The remainder of this report has adopted the SLC approach for two main reasons:

- It is consistent with the approach adopted by Volterra Consulting for their work on the Thames Gateway Bridge.
- For the *all schemes* scenario it produces the closest match to the employment growth distribution in the employment projections as given in *GLA Economics Working Paper 11: Working London Employment Projections by Sector November 2004*. The *all schemes* scenario is similar to the Mayor's *Transport Strategy* that is taken as being compatible with the *London Plan*.

One exception has been made to these approaches for distributing growth. That is for the Heathrow ward as employment growth at the airport is more site-specific than in other sectors. Volterra Consulting's structural update growth figure of 10,217 additional jobs by 2016 has therefore been fixed for all approaches and scenarios.

4.2 Distribution results by scenario

This section of the report moves on to assessing how the distribution of employment growth varies according to different transport infrastructure scenarios. As previously mentioned, the SLC approach is used throughout. All these results are produced by fixing total growth to the 541,146 jobs predicted within the GLA employment projections 2004, thus all that changes is the distribution of that growth.

Table 4.3 (a) shows the overall distribution of projected employment growth from 2002 to 2016 as assumed by the GLA employment projections 2004 and according to each of the six transport infrastructure scenarios defined in Chapter 3. Table 4.3 (b) shows each scenario as a percentage of the *London Plan* base.

Table 4.3(a): Distribution of employment growth by scenario

Scenario	Central	East	North	South	West	TOTAL
GLA Employment projections	268,466	153,224	17,046	23,049	79,361	541,146
Thameslink 2000	262,847	130,315	36,861	81,148	29,974	541,146
Crossrail	199,388	278,828	3,286	101	59,543	541,146
PPP	320,390	95,874	33,059	9,519	82,304	541,146
ELLX & Crossrail	192,251	283,137	6,482	6,830	52,446	541,146
All schemes	272,038	159,917	25,027	11,237	72,926	541,146

Table 4.3(b): Distribution of employment growth by scenario (% of GLA employment projections 2004)

Scenario	Central	East	North	South	West
GLA employment projections	100%	100%	100%	100%	100%
Thameslink 2000	98%	85%	216%	352%	38%
Crossrail	74%	182%	19%	0%	75%
PPP	119%	63%	194%	41%	104%
ELLX & Crossrail	72%	185%	38%	30%	66%
All schemes	101%	104%	147%	49%	92%

Tables 4.4 (a) and (b) show the distribution of growth within the same sub-areas described in Tables 4.2 (a) and (b). Again bear in mind that the results have been scaled up to match the 541,146 total for employment growth. Results without this scaling are discussed in Section 5.

Table 4.4 (a) Distribution of employment growth by scenario

Scenario	CF	Cit	IoD	NC	SEC	SWC	VW	WE	Total
GLA Employment projections	74,260	39,654	27,825	38,330	6,121	22,534	32,927	46,923	288,575
Thameslink 2000	50,056	17,872	1,871	15,002	23,026	26,646	8,726	8,296	151,493
Crossrail	53,968	13,122	65,013	45,395	18,261	17,675	10,441	36,995	260,871
PPP	33,857	6,833	9,882	22,873	50,065	48,974	14,838	23,269	210,591
ELLX & Crossrail	52,891	10,038	57,703	31,065	34,550	16,743	8,058	25,339	236,387
All	38,564	7,290	31,958	24,288	36,318	34,642	13,385	22,514	208,960

Table 4.4 (b). Distribution of employment growth by scenario (% of GLA Employment projections 2004)

Scenario	CF	Cit	IoD	NC	SEC	SWC	VW	WE	Total
GLA employment projections	100%	100%	100%	100%	100%	100%	100%	100%	100%
Thameslink 2000	67%	45%	7%	39%	376%	118%	27%	18%	52%
Crossrail	73%	33%	234%	118%	298%	78%	32%	79%	90%
PPP	46%	17%	36%	60%	818%	217%	45%	50%	73%
ELLX & Crossrail	71%	25%	207%	81%	564%	74%	24%	54%	82%
All	52%	18%	115%	63%	593%	154%	41%	48%	72%

Some brief comments follow on each of the infrastructure scenarios:

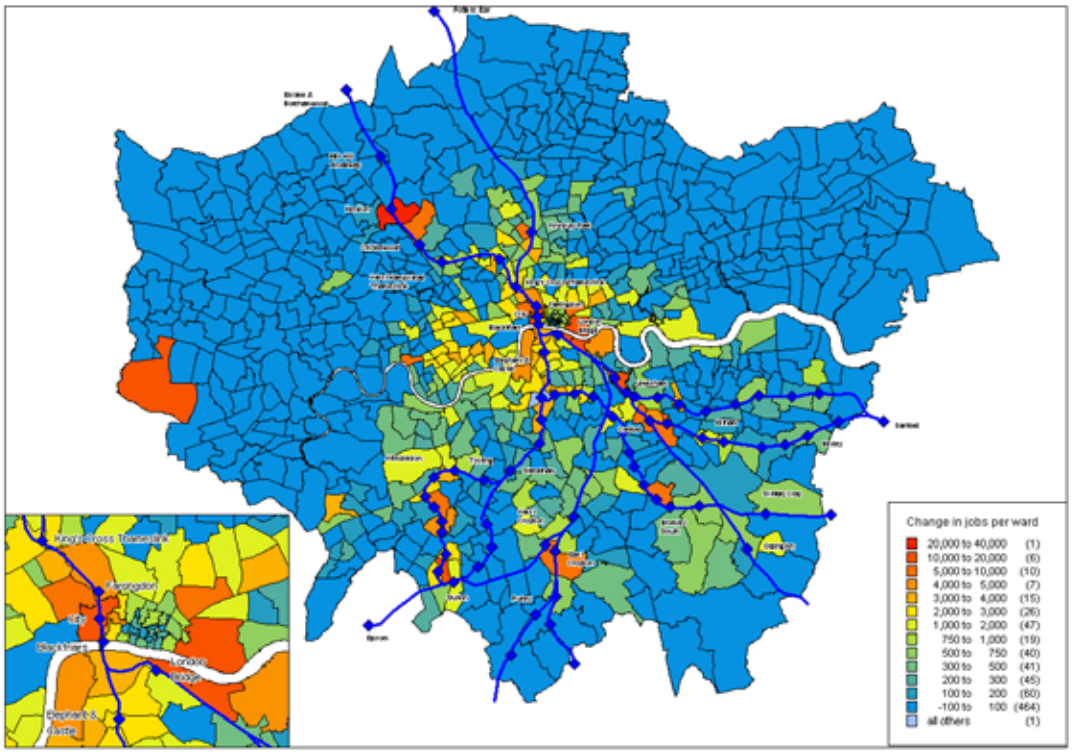
ELLX

Distributing London's future employment growth purely on the basis of the ELLX project is an unlikely scenario and because of that these results have not been included in this section. Section 5 shows the increase in employment (73,000 jobs) that the model suggests might be compatible with a scenario of building only the ELLX. Extrapolating those 73,000 jobs up to the 541,146 in the GLA employment projections 2004 produced some rather strange and not very useful results.

Thameslink 2000

The Thameslink 2000 scenario produces a relatively low proportion of total growth within the sub-areas, with only one quarter of total growth (151,000 jobs out of 541,000) within the sub-areas. The overall pattern of growth is centred around the Thameslink alignment through Central London. This is shown in Figure 4.3. The model predicts the highest employment growth on the western edge of the City, north to King's Cross and south to London Bridge and Elephant and Castle. Growth spreads east and west along the Circle and District lines and isolated pockets of growth can be seen north and south of the Central area corresponding to stations where Thameslink 2000 significantly improves accessibility.

Figure 4.3. Distribution of employment by ward – growth fixed to GLA employment projections 2004 (Thameslink 2000)

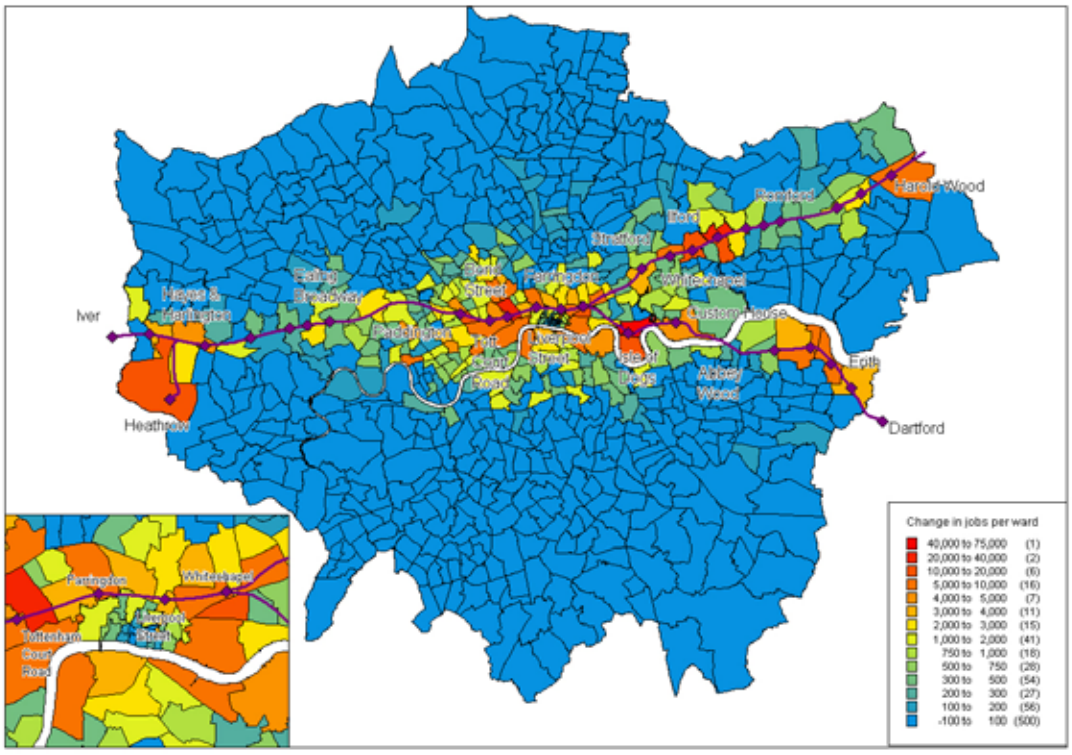


Crossrail

At a regional level, the Crossrail results show almost all the forecast employment growth taking place in the Central and Eastern regions, some 88 per cent of the total. There is virtually no growth in the North or South regions. That is clearly to be expected, especially for a measure of accessibility that does not incorporate the wider congestion relief impacts of Crossrail. Figure 4.4 shows the distribution of the forecasted employment growth by ward closely following the Crossrail alignment in the outer areas and spread around within Central London.

Within the sub-regional areas, Crossrail results in significant growth in the City Fringe, Isle of Dogs, North Central and the West End. Crossrail is the only scheme that has a significant impact on the Isle of Dogs. The SLC approach to distribution means that growth within the City is relatively low.

Figure 4.4. Distribution of employment by ward – growth fixed to GLA employment projections 2004 (Crossrail)

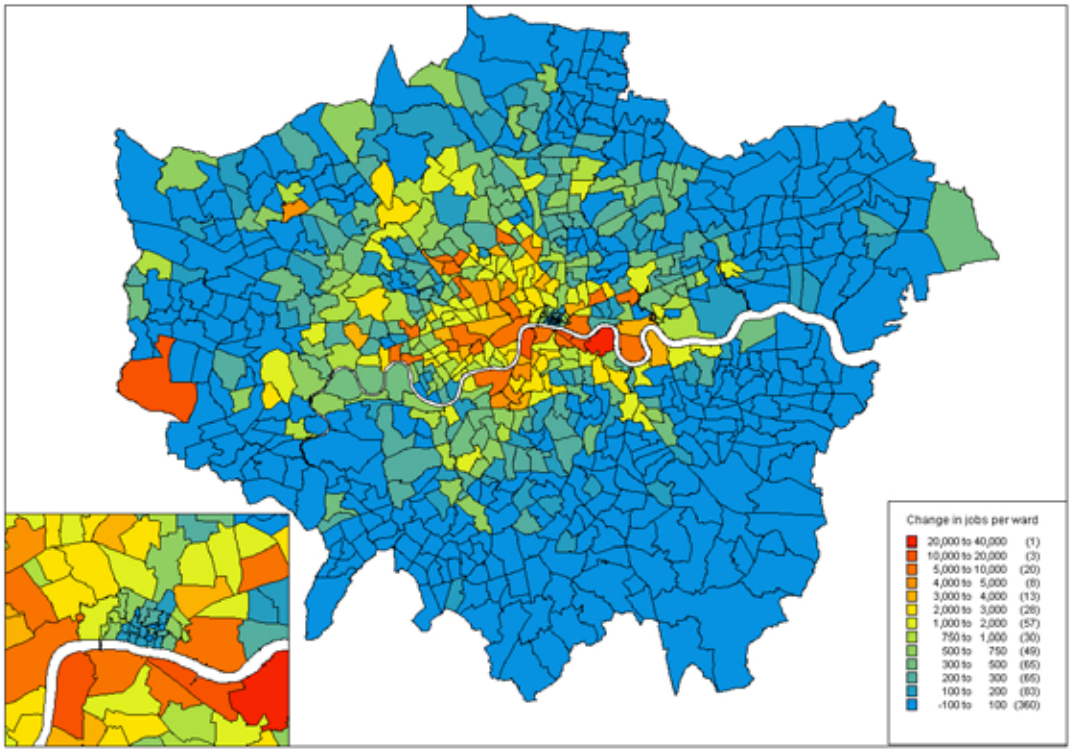


PPP

The PPP scenario concentrates growth within the Central region where the London Underground network is most dense. It produces relatively low employment growth in the South and East where the Underground is less widespread or accessible, and rather more growth in the North and West. The PPP distribution is shown in Figure 4.5.

Looking at the sub-regional areas, the PPP predicts substantial growth south of the river in South-East Central and South-West Central areas, but little growth in the City, Isle of Dogs or Victoria and Westminster. The areas south of the river benefit from proposed improvements to the Jubilee, Northern and Victoria lines.

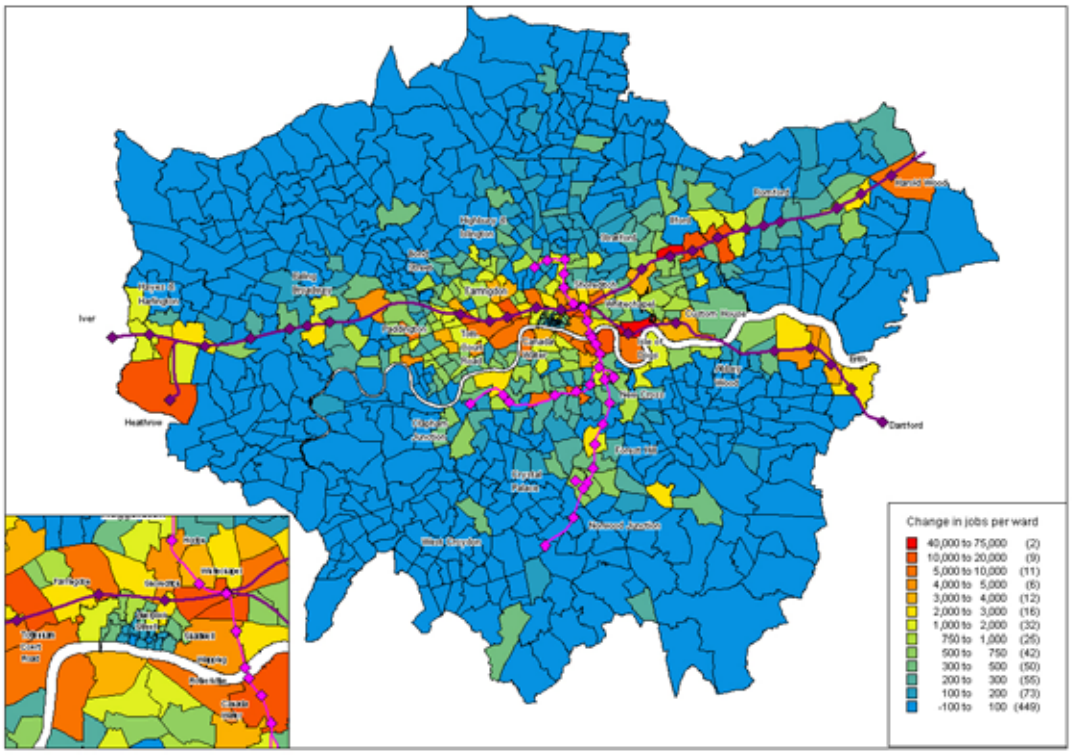
Figure 4.5. Distribution of employment by ward – growth fixed to GLA employment projections 2004 (PPP)



ELLX and Crossrail

The ELLX and Crossrail scenario concentrates growth within the East and Central regions, with little growth to the North or South. The distribution is shown in Figure 4.6. Clusters of growth are predicted around Whitechapel where the two lines intersect, at each of Crossrail's central stations, at Surrey Quays on ELLX, and on Crossrail east of Stratford and east of Abbey Wood.

Figure 4.6. Distribution of employment by ward – growth fixed to GLA employment projections 2004 (ELLX and Crossrail)

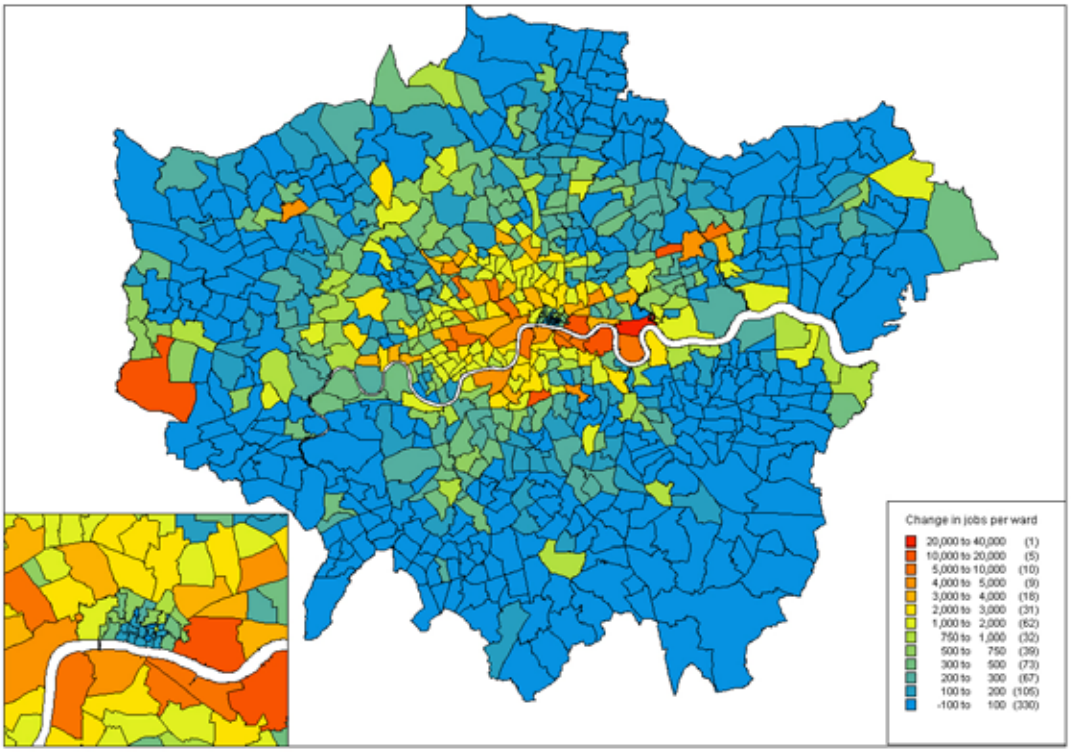


All schemes

When compared with the GLA employment projections 2004, at a regional level the match is very close for all five regions (within about 10,000 jobs of the forecast). Moving down to the sub-areas, differences become more apparent.

At a sub-area level the combination of all schemes produces large gains around the City, spread between the City Fringe, North Central, South-East Central, South-West Central and the Isle of Dogs. The effect of having all the schemes is to reduce the impact of any individual scheme leading to a more balanced distribution. This is shown in Figure 4.7.

Figure 4.7. Distribution of employment by ward – growth fixed to GLA employment projections 2004 (all options)



4.3 Conclusions

This section describes how a fixed employment growth total might be distributed according to the accessibility improvements provided by a variety of infrastructure scenarios. Throughout the analysis the results of the accessibility model have been scaled up or down to match the GLA employment projections 2004.

The results show a number of patterns:

- All scenarios predict substantial growth in the South-East Central and South-West Central areas, significantly more than predicted by GLA employment projections 2004.
- Crossrail has a very significant impact on the amount of growth taking place in the East region, including but not limited to the Isle of Dogs.
- The only scheme to result in significant employment growth in the North and South regions is Thameslink 2000.
- The balanced distribution produced by the *all schemes* scenario is notable. It seems to emphasise the inherent compatibility between the Mayor's *Transport Strategy* and the *London Plan* and the threat posed to employment growth by not implementing sufficient transport infrastructure.

5 Employment growth forecasts by scenario

5.1 Introduction

Section 4 described how the growth expected by the GLA employment projections 2004 might be distributed according to expected changes in accessibility. It therefore tested how a fixed amount of growth might be allocated across London. It is also possible to use the relationship between accessibility and density to determine what level of growth might be associated with alternative infrastructure scenarios.

There are a few key issues that need to be remembered when interpreting the results of this chapter:

Measure of accessibility

The approach adopted has been to measure 45-minute isochrones. This excludes a number of elements that contribute towards the 'generalised cost' of travel such as interchange penalties, crowding penalties, and weights attached to walking and waiting times on journeys.

Capacity issues

These are ignored in the accessibility analysis and hence in the employment growth forecasts.

Straight Line Capping

The absolute forecasts have been reduced, especially within the Central area, by the adoption of the SLC approach. Without that capping, the results were significantly higher and clearly unrealistic.

5.2 Results by scenario

The forecast growth in employment capacity resulting from each of the schemes and the distribution of that growth by region are shown in Tables 5.1 (a) and (b).

Table 5.1(a): Forecast employment growth by region by scenario

Scenario	Central	East	North	South	West	TOTAL
GLA employment projections 2004	268,466	153,224	17,046	23,049	79,361	**541,146**
ELLX	28,481	23,473	2,123	3,109	15,029	**72,215**
Thameslink 2000	56,273	28,054	7,940	17,480	14,473	**124,219**
Crossrail	64,157	89,743	1,058	32	26,099	**181,089**
PPP	253,227	75,776	26,129	7,452	67,192	**429,776**
ELLX & Crossrail	91,594	135,044	3,025	3,156	30,306	**263,125**
All schemes	453,874	266,801	41,756	18,717	114,842	**895,991**

Table 5.1(b) Distribution of employment growth by scenario (% of GLA Employment projections 2004)

Scenario	C	E	N	S	W	Total
ELLX	11%	15%	12%	13%	19%	**13%**
Thameslink 2000	21%	18%	47%	76%	18%	**23%**
Crossrail	24%	59%	6%	0%	33%	**33%**
PPP	94%	49%	153%	32%	85%	**79%**
ELLX & Crossrail	34%	88%	18%	14%	38%	**49%**
All schemes	169%	174%	245%	81%	145%	**166%**

The forecasts of absolute growth by scenario seem to follow a sensible pattern. ELLX produces the lowest forecast of employment growth (72,000), followed by Thameslink 2000 (124,000), then Crossrail (181,000) and finally PPP (430,000). As mentioned in the introduction to this chapter it is probable that the impacts of Crossrail and Thameslink are underplayed relative to those of the PPP improvements because of the way in which accessibility is measured.

None of the schemes on their own would provide a sufficient improvement in accessibility to accommodate the GLA employment forecasts 2004. PPP gets closest, but only the *all schemes* scenario exceeds the 541,000 expected employment growth.

Of particular concern is the shortfall of employment in the Central and East (including City and Isle of Dogs) regions. Only if the PPP agreements are implemented in full would this analysis show that the Central region could accommodate expected growth. The same applies to the East region. Even with Crossrail and ELLX, the East region would still fall short of expected growth.

Table 5.2(a): Distribution of employment growth by scenario

Scenario	CF	Cit	IoD	NC	SEC	SWC	VW	WE	Total
GLA employment projections 2004	74,260	39,654	27,825	38,330	6,121	22,534	32,927	46,923	288,575
ELLX	7,431	620	2,147	936	9,660	2,976	643	294	24,705
Thameslink 2000	10,446	3,850	403	3,231	4,960	5,740	1,880	1,787	32,296
Crossrail	17,376	4,225	20,932	14,616	5,880	5,691	3,362	11,911	83,993
PPP	26,759	5,401	7,810	18,078	39,570	38,708	11,728	18,391	166,444
ELLX & Crossrail	25,247	4,792	27,544	14,829	16,492	7,992	3,846	12,095	112,837
All schemes	64,342	12,164	53,320	40,523	60,594	57,797	22,332	37,562	348,634

Table 5.2 (b) Distribution of employment growth by scenario (% of GLA employment projections 2004

Scenario	CF	Cit	IoD	NC	SEC	SWC	VW	WE	Total
GLA employment projections 2004	100%	100%	100%	100%	100%	100%	100%	100%	100%
ELLX	10%	2%	8%	2%	158%	13%	2%	1%	9%
Thameslink 2000	14%	10%	1%	8%	81%	25%	6%	4%	11%
Crossrail	23%	11%	75%	38%	96%	25%	10%	25%	29%
PPP	36%	14%	28%	47%	646%	172%	36%	39%	58%
ELLX & Crossrail	34%	12%	99%	39%	269%	35%	12%	26%	39%
All schemes	87%	31%	192%	106%	990%	256%	68%	80%	121%

Tables 5.2 (a) and (b) show the levels of employment growth expected within each of the Central London sub-areas and for all the sub-areas combined. Only the *all schemes* scenario exceeds the level of growth expected within the GLA employment projections 2004. ELLX and Thameslink 2000 both have little impact on employment growth within the sub-areas, being compatible with nine per cent and 11 per cent of the GLA employment forecast 2004 forecast respectively.

Distributions of growth for each of the six infrastructure scenarios are shown in Figures 5.1 to 5.6 respectively.

Figure 5.1. Distribution of employment by ward – distribution by accessibility (ELLX)

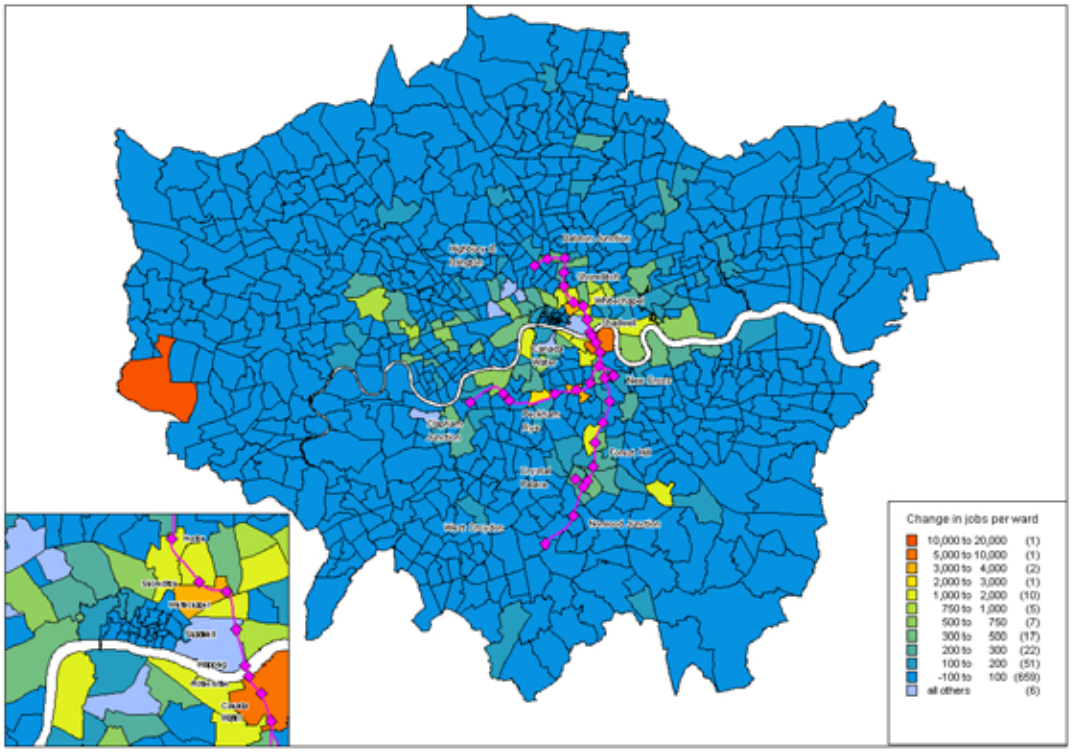


Figure 5.2. Distribution of employment by ward – distribution by accessibility (Thameslink 2000)

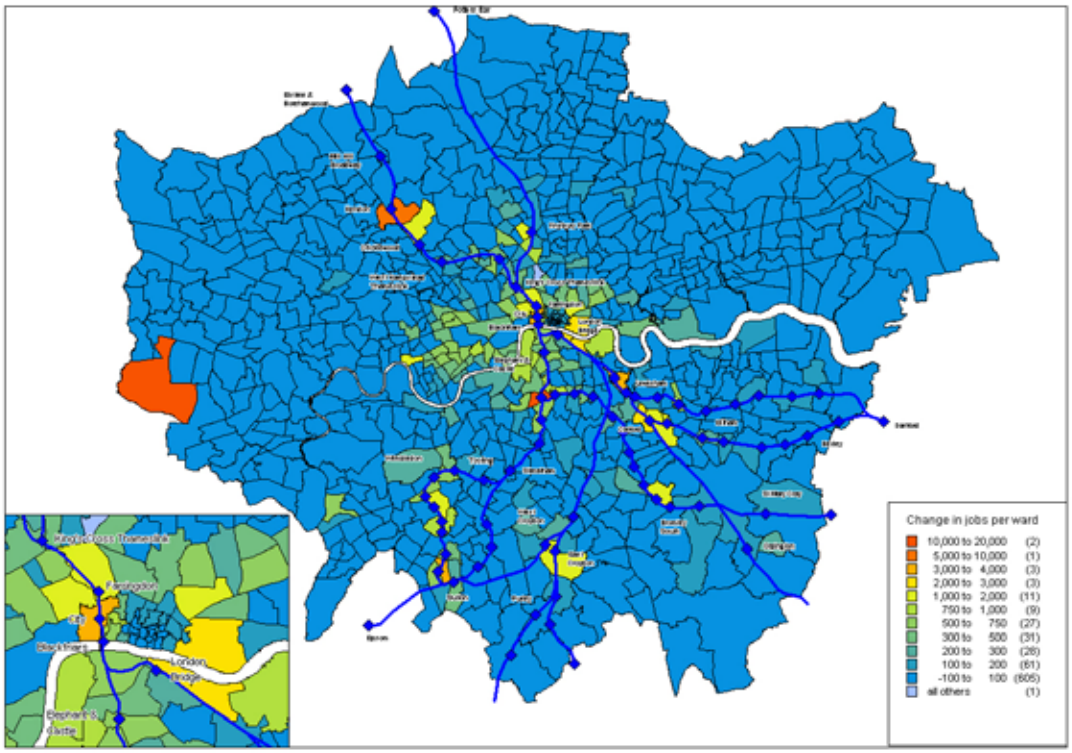


Figure 5.3. Distribution of employment by ward – distribution by accessibility (Crossrail)

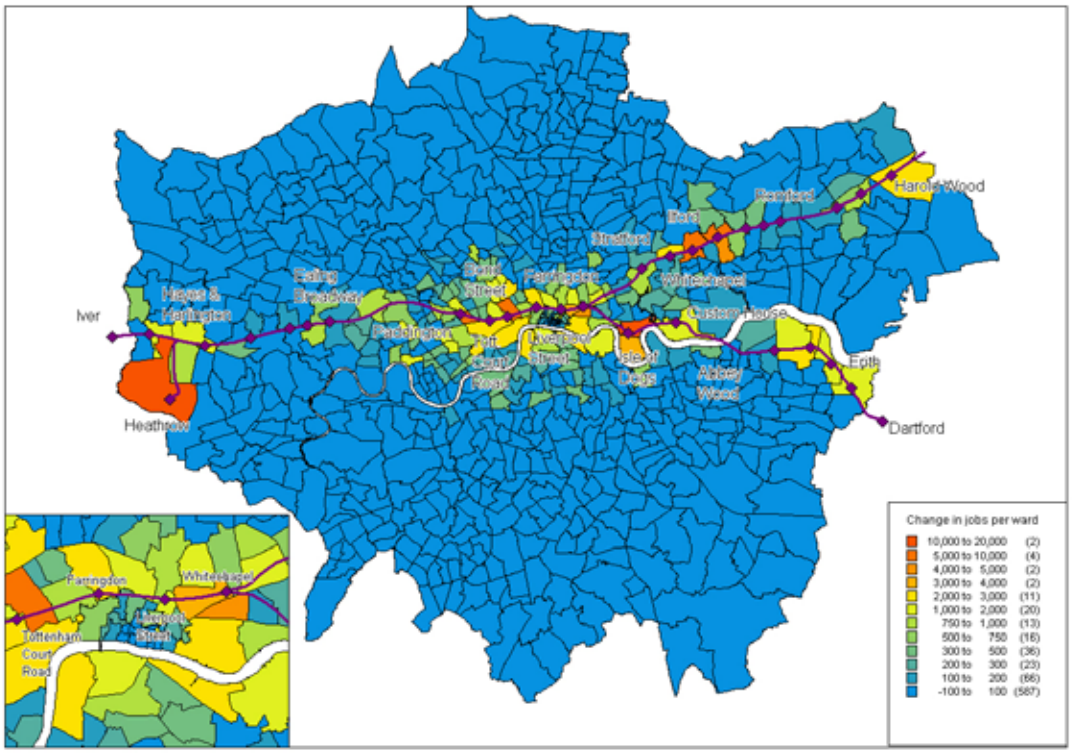


Figure 5.4. Distribution of employment by ward – distribution by accessibility (PPP)

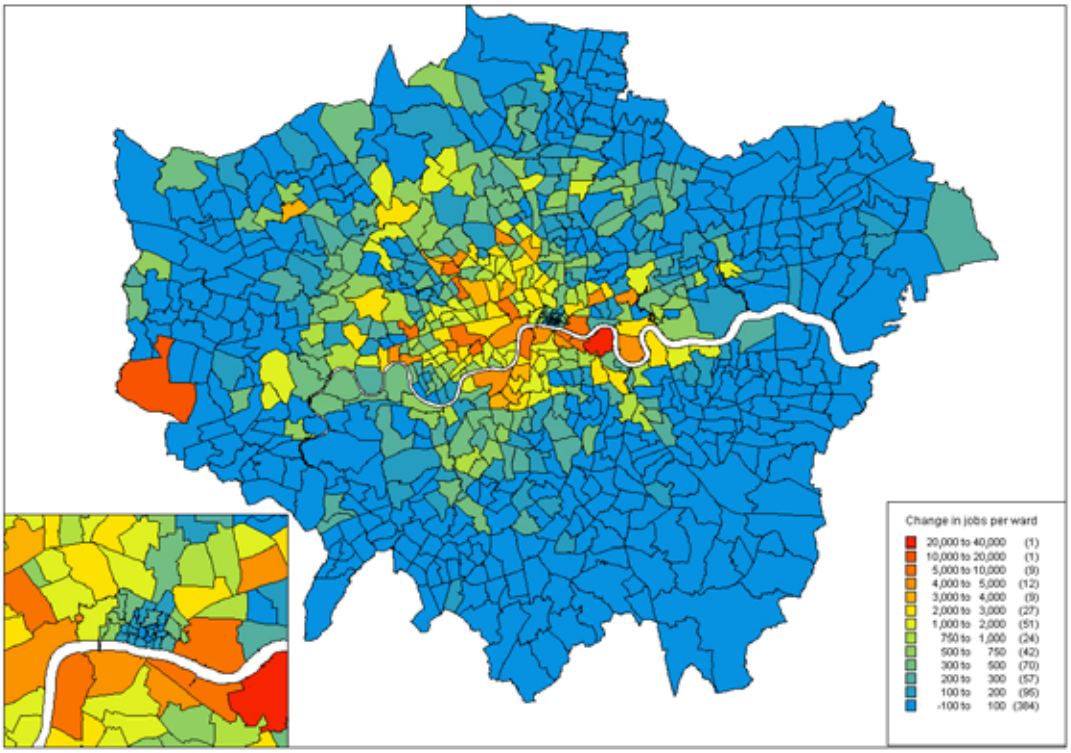


Figure 5.5. Distribution of employment by ward – distribution by accessibility (ELLX and Crossrail)

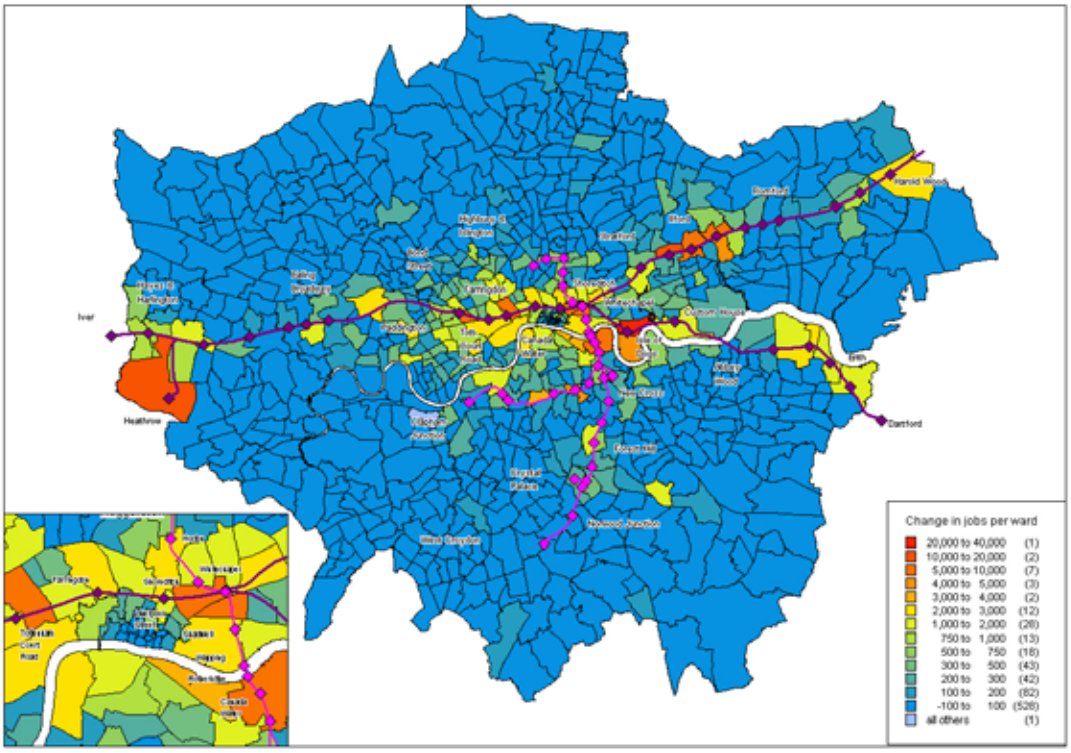
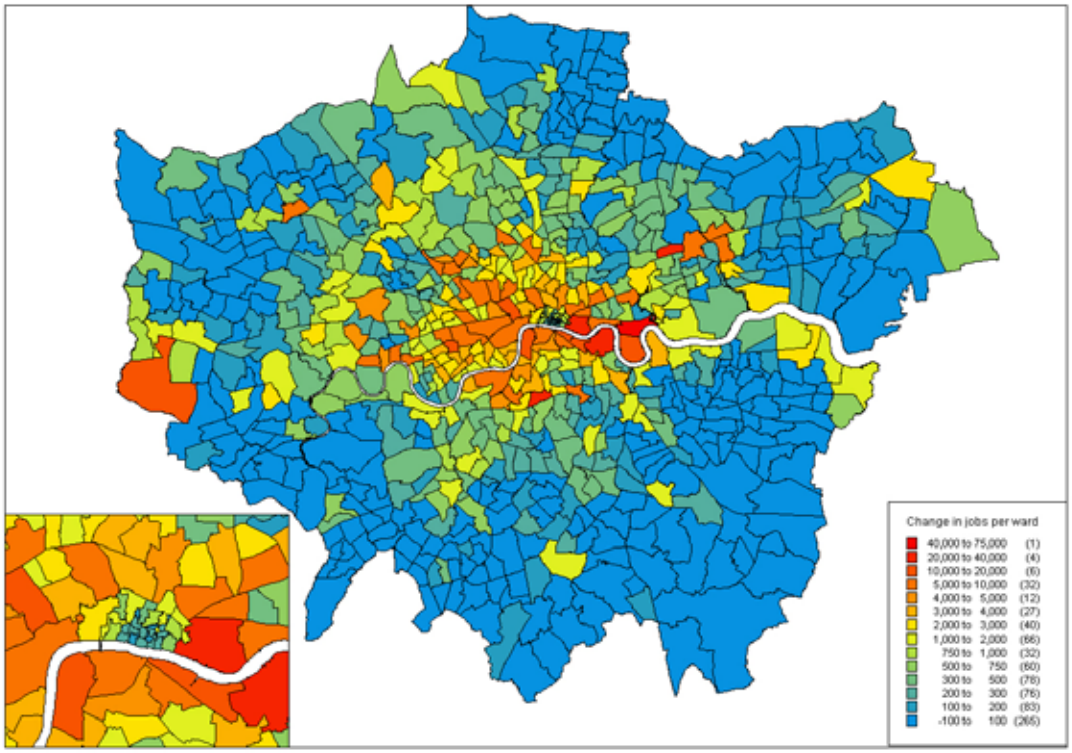


Figure 5.6. Distribution of employment by ward – distribution by accessibility (all options)



Crossrail adds 21,000 jobs to the Isle of Dogs, a further 21,000 between the City and City Fringe and another 42,000 within the other Central London sub-areas.
The PPP scenario produces four times as many additional jobs within the Central region as Crossrail (253,000 compared to 64,000) largely because it affects a much wider range of locations. Within the sub-areas the PPP improvements generate considerable scope for employment growth south of the river in South-East Central and South-West Central.

ELLX and Crossrail combined add 28,000 jobs to the Isle of Dogs and a further 30,000 to City and City Fringe, but do not produce large amounts of growth in any of the other sub-areas.

The *all schemes* scenario is forecast to result in very large growth in the City Fringe, Isle of Dogs, South-East Central and South-West Central areas. There appears to be considerable synergy (presumably between the Crossrail and PPP schemes), which means that the combination of all schemes results in higher growth than the sum of the individual schemes.

5.5 Conclusions on growth forecasts

Using the model to produce forecasts of employment growth compatible with alternative infrastructure scenarios is potentially much more useful than the analysis in Section 4 which used the model simply to distribute a fixed amount of employment growth.

The choice of the SLC approach to calculate absolute levels of employment growth does have a large impact on the amount of growth expected.

Further details are included in Appendix A2 that show the distribution of employment growth by borough for GLA Employment projections 2004 and for each of the six infrastructure scenarios.

6. Summary and conclusions

6.1 Introduction

This study has taken the relationship found in earlier research between accessibility and employment density and used it to test the links between future changes in accessibility and the distribution and the volume of future employment growth. The results do not necessarily represent the 'best' or 'most likely' distribution of future employment growth, but show what the distribution might be if accessibility were the only criterion and help explore the relationship between alternative infrastructure scenarios and future employment growth.

The remainder of this chapter describes the conclusions under three headings:

- Distribution of GLA Economics forecast employment growth
- Employment growth forecasts
- General conclusions

6.2 Distribution of GLA Economics forecast employment growth

When interpreting these conclusions it must be remembered that a fixed amount of employment growth has been distributed according to the accessibility changes arising from individual or a combination of schemes. In some instances the incompatibility between the scale of the transport changes and employment growth can lead to strange distributions. The key conclusions arising from this analysis are:

(1) Development in the east

Crossrail and the ELLX are the two schemes that benefit East London. Without those two schemes, development in the east will need to take place despite a lack of change in accessibility rather than because of accessibility improvements.

(2) PPP

The PPP proposals fix employment growth firmly in the centre, west and north of London, apart from the impact of the improvements to the Jubilee line extension on the Isle of Dogs, North Greenwich and the Royals.

(3) South of the river

Most of the infrastructure scenarios predict substantial employment growth south of the river between Vauxhall and Bermondsey. This is perhaps in part because development has not caught up with the accessibility improvements delivered by the Jubilee line extension but is also likely to reflect the better image and hence developer preferences for sites north of the river.

6.3 Employment growth forecasts

The next stage of the analysis calculated the scale of employment growth compatible with each of the infrastructure scenarios. Again a certain amount of care is needed in the interpretation:

- Within the dataset of London ward accessibility and employment density there exists wide variations in employment density at all levels of accessibility.
- The choices between the alternative methods of calculating the level of employment growth (absolute, relative and SLC) have been shown to significantly change the results.

Nonetheless, the following conclusions seem sensible:

(1) PPP has the largest employment growth potential

The scale of employment growth consistent with the PPP improvements to the Underground is significantly greater than for any other scheme. The impact is possibly exaggerated by the method of measuring accessibility, but also illustrates what a major achievement delivering the PPP would be. Even PPP on its own would not however be sufficient to accommodate all the growth expected in the GLA employment projections 2004.

The growth attributed to PPP represents *potential* for employment growth using accessibility as the sole criterion. Growth is attributed to a large number of wards where the Underground is relatively dense. However, in reality the potential for employment growth may be somewhat smaller where planning policy aimed at preserving the character of certain areas restricts high density developments or where lack of spare capacity in the Underground network restricts growth.

(2) ELLX and Crossrail

ELLX and Crossrail improve accessibility compatible with some 210,000 increases in employment in the Central and East regions, with more of that growth in the East. Only with Crossrail and ELLX can the eastward focus of employment growth envisaged in the *London Plan* be consistent with accessibility improvements.

(3) Transport infrastructure

The analysis suggests that substantial additional infrastructure will be required if the GLA Employment forecasts are to be achieved. Only the *all schemes* scenario exceeds the employment growth forecast. A scenario consisting of ELLX, Crossrail, and approximately 70 per cent of the proposed PPP enhancements would be roughly in line with GLA employment forecasts for employment in 2016.

6.4 Overall conclusions

Our main conclusion is that the *London Plan* (and GLA employment projections 2004) are broadly compatible with the Mayor's *Transport Strategy*, represented here by the *all schemes* scenario. The concern is that the *Transport Strategy* seems unlikely to be delivered within the timescale envisaged which seems likely to have implications on both the level and distribution of future employment growth.

Issues about timing must be of concern. While developers may continue existing patterns of development even without much new transport infrastructure, they are

unlikely to significantly change those patterns. If the eastward shift in employment growth is to be achieved then additional transport infrastructure seems likely to be required to spur that growth. ELLX and Crossrail are the two key projects in terms of providing potential for employment growth in East London.

7. Appendices

Appendix A1 - Figures

Appendix A2 – Employment growth by borough

In addition to the analysis presented in the main report, the distribution of growth has also been assessed by borough. The key scenarios are taken from the forecasts of growth capped to the employment projections described in Chapter 4, and employment growth described in Chapter 5. Tables A2.1 (a) and A2.2 (a) provide the details of growth forecast for each borough under each scenario. Tables A2.1 (b) and A2.2 (b) give the employment growth predicted by the accessibility change as a percentage of the employment projections[1]. The summary findings are:

(a) Boroughs with negative growth in the employment projections

There are six boroughs forecast to have (small) negative growth in the employment projections; Croydon, Barking & Dagenham, Waltham Forest, Bexley, Ealing and Haringey.

The approach to modelling changes in accessibility does not produce any boroughs with negative growth, but it is worth pointing out that:

- Ealing and Bexley gain significant accessibility improvements from Crossrail
- Ealing, Haringey and Waltham Forest gain from PPP
- Croydon would benefit from Thameslink 2000.

On the basis of the accessibility improvements, if the transport schemes are implemented we would expect employment growth to take place within the boroughs identified above.

(b) Boroughs with large growth in the employment projections

There are four boroughs in the employment projections that are expected to grow by more than 50,000 jobs. These are Camden (50,000), City (53,000), Tower Hamlets (73,000) and Westminster (84,000), giving a total for those four boroughs of 260,000 jobs.

The accessibility analysis suggests that this can only be achieved with the 'all schemes' scenario otherwise total growth within those four key boroughs is only half of the employment projections with the PPP scheme and considerably lower with the other scenarios.

[1] As given in the GLA Economics Working Paper 11: Working London Employment Projections by Sector November 2004

(c) Largest variations and differences from the employment projections

The largest variations in the accessibility-based forecasts and the biggest differences from the employment projections are found in:

Newham – here the GLA Employment projections suggests minimal employment growth but the accessibility analysis suggests employment growth arising from Crossrail and PPP, with substantial growth (45,000 jobs) compatible with the 'all schemes' scenario.

City - the GLA Employment projections suggests over 50,000 employment growth but the accessibility analysis gives a range from 5-15,000. That is largely a function of the *Straight Line Capped* approach to calculating employment growth. Using the *Relative* approach (see Chapter 3 for discussion of alternative approaches) would have given an increase for the 'all schemes' scenario of over 60,000 jobs. Growth is probably dependent more on transport capacity and on availability of development sites than on changes in accessibility.

Southwark – the GLA Employment projections predicts an increase of 18,000 jobs by 2016 but the accessibility analysis predicts much higher growth in the 'all schemes' scenario (over 85,000) with the most important schemes being the PPP improvements to the Jubilee line and the ELLX.

Lambeth – the accessibility analysis shows a very wide range of employment growth depending on which infrastructure schemes are assumed. If Thameslink 2000 or PPP are implemented then forecasts are in excess of the GLA Employment projections, if all schemes are implemented then the forecast is in excess of 60,000 jobs.

Table A2.1 (a) Employment Growth forecasts capped to GLA employment projections 2004 total by borough by scenario

Borough	GLA Employment Projections	Thameslink 2000	Crossrail	PPP	ELLX & Crossrail	All schemes
Croydon	-6,975	13,908	0	907	1,147	1,962
Barking and Dagenham	-4,912	0	1,383	2,557	1,247	4,141
Waltham Forest	-4,895	538	1,960	3,919	2,488	3,449
Bexley	-3,702	4,406	19,458	113	13,179	4,754
Ealing	-3,157	131	13,212	11,142	11,191	11,115
Haringey	-1,951	4,916	1,138	11,383	2,308	8,580
Bromley	1,564	15,946	0	637	4,928	1,925
Newham	1,571	3,467	42,485	9,427	67,365	27,373
Greenwich	2,599	9,642	6,186	9,517	5,727	6,114
Enfield	2,674	0	0	3,537	1,135	2,664
Brent	4,583	1,220	2,923	10,099	2,859	8,235
Sutton	4,615	23,987	0	318	34	620
Merton	4,623	21,897	0	3,522	466	4,002
Havering	5,801	0	16,181	1,025	10,996	3,928
Lewisham	7,141	39,347	1,953	11,005	9,174	8,893
Redbridge	7,655	0	48,281	1,936	36,258	11,791
Harrow	8,737	0	0	7,263	41	6,885
Kingston upon Thames	9,152	5,410	0	673	78	660
Hounslow	9,941	0	1,020	11,397	1,272	11,049
Richmond upon Thames	10,070	0	101	3,462	177	2,068
Hackney	11,157	5,842	9,077	7,901	12,036	12,301
Southwark	17,789	40,678	28,293	65,212	52,115	52,732
Lambeth	19,500	103,552	11,032	42,059	16,555	40,406
Barnet	21,217	31,408	188	14,221	550	10,334
Wandsworth	22,544	8,832	2,197	15,978	5,986	13,935
Hammersmith and Fulham	29,514	18,406	19,674	29,490	16,856	20,773
Hillingdon	29,742	10,217	22,714	12,912	20,227	14,869
Kensington and Chelsea	35,922	31,004	26,742	44,052	21,188	33,938
Islington	38,364	28,242	13,958	36,355	12,809	29,927
Camden	50,098	26,250	55,715	61,301	39,267	51,976
City of London	52,977	32,132	15,013	8,591	11,866	8,690
Tower Hamlets	72,937	35,480	118,811	43,801	115,290	71,932
Westminster	84,249	24,291	61,451	55,433	44,330	49,124
Total	**541,146**	**541,146**	**541,146**	**541,146**	**541,146**	**541,146**

Table A2.1 (b) Employment Growth forecasts capped to GLA employment projections 2004 total by borough by scenario as % of GLA employment projections 2004

Borough	GLA Employment projections	Thameslink 2000	Crossrail	PPP	ELLX & Crossrail	All schemes
Croydon	100%	-199%	0%	-13%	-16%	-28%
Barking and Dagenham	100%	0%	-28%	-52%	-25%	-84%
Waltham Forest	100%	-11%	-40%	-80%	-51%	-70%
Bexley	100%	-119%	-526%	-3%	-356%	-128%
Ealing	100%	-4%	-418%	-353%	-354%	-352%
Haringey	100%	-252%	-58%	-583%	-118%	-440%
Bromley	100%	1019%	0%	41%	315%	123%
Newham	100%	221%	2704%	600%	4288%	1742%
Greenwich	100%	371%	238%	366%	220%	235%
Enfield	100%	0%	0%	132%	42%	100%
Brent	100%	27%	64%	220%	62%	180%
Sutton	100%	520%	0%	7%	1%	13%
Merton	100%	474%	0%	76%	10%	87%
Havering	100%	0%	279%	18%	190%	68%
Lewisham	100%	551%	27%	154%	128%	125%
Redbridge	100%	0%	631%	25%	474%	154%
Harrow	100%	0%	0%	83%	0%	79%
Kingston upon Thames	100%	59%	0%	7%	1%	7%
Hounslow	100%	0%	10%	115%	13%	111%
Richmond upon Thames	100%	0%	1%	34%	2%	21%
Hackney	100%	52%	81%	71%	108%	110%
Southwark	100%	229%	159%	367%	293%	296%
Lambeth	100%	531%	57%	216%	85%	207%
Barnet	100%	148%	1%	67%	3%	49%
Wandsworth	100%	39%	10%	71%	27%	62%
Hammersmith and Fulham	100%	62%	67%	100%	57%	70%
Hillingdon	100%	34%	76%	43%	68%	50%
Kensington and Chelsea	100%	86%	74%	123%	59%	94%
Islington	100%	74%	36%	95%	33%	78%
Camden	100%	52%	111%	122%	78%	104%
City of London	100%	61%	28%	16%	22%	16%
Tower Hamlets	100%	49%	163%	60%	158%	99%
Westminster	100%	29%	73%	66%	53%	58%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Table A2.2 (a) Employment Growth by borough by scenario

Borough	GLA Employment Projections	ELLX	Thames-link 2000	Crossrail	PPP	ELLX & Crossrail	All schemes
Croydon	-6,975	447	2,996	0	646	447	3,241
Barking and Dagenham	-4,912	161	0	445	2,021	594	6,908
Waltham Forest	-4,895	363	116	631	3,097	1,118	5,755
Bexley	-3,702	30	949	6,265	89	6,291	7,932
Ealing	-3,157	1,218	28	4,254	8,807	5,330	18,544
Haringey	-1,951	1,017	1,059	366	8,996	1,102	14,314
Bromley	1,564	2,337	3,435	0	503	2,352	3,211
Newham	1,571	2,410	747	13,679	7,451	32,156	45,669
Greenwich	2,599	1,482	2,061	1,960	7,522	2,716	10,196
Enfield	2,674	542	0	0	2,796	542	4,445
Brent	4,583	411	263	941	7,982	1,365	13,740
Sutton	4,615	13	5,167	0	252	13	1,035
Merton	4,623	223	4,717	0	2,783	223	6,678
Havering	5,801	-2	0	5,210	810	5,239	6,554
Lewisham	7,141	3,536	8,475	629	8,698	4,300	14,832
Redbridge	7,655	533	0	15,545	1,530	17,307	19,673
Harrow	8,737	19	0	0	5,740	19	11,487
Kingston upon Thames	9,152	37	1,165	0	532	37	1,101
Hounslow	9,941	312	0	328	9,008	607	18,434
Richmond upon Thames	10,070	52	0	32	2,737	85	3,451
Hackney	11,157	2,760	1,258	2,923	6,245	5,745	20,523
Southwark	17,789	14,339	8,762	9,110	51,541	24,876	87,979
Lambeth	19,500	4,773	22,296	3,552	33,242	7,902	67,414
Barnet	21,217	201	6,765	60	11,240	263	17,242
Wandsworth	22,544	2,171	1,902	707	12,628	2,713	23,249
Hammersmith and Fulham	29,514	2,852	3,965	6,335	23,308	7,989	34,658
Hillingdon	29,742	10,217	10,217	14,241	12,347	14,995	17,979
Kensington and Chelsea	35,922	2,427	6,678	8,610	34,818	10,114	56,623
Islington	38,364	1,807	5,747	4,454	28,734	6,110	49,931
Camden	50,098	1,472	5,654	17,938	48,451	18,722	86,719
City of London	52,977	725	6,921	4,834	6,790	5,664	14,499
Tower Hamlets	72,937	11,839	7,643	38,254	34,619	55,032	120,013
Westminster	84,249	1,492	5,232	19,785	43,812	21,157	81,960
Total	**541,146**	**72,215**	**124,219**	**181,089**	**429,776**	**263,125**	**895,991**

Table A2.2 (b) Employment Growth by borough by scenario as % of GLA employment projections 2004

Borough	GLA employment projections	ELLX	Thameslink 2000	Crossrail	PPP	ELLX & Crossrail	All schemes
Croydon	100%	-6%	-43%	0%	-9%	-6%	-46%
Barking and Dagenham	100%	-3%	0%	-9%	-41%	-12%	-141%
Waltham Forest	100%	-7%	-2%	-13%	-63%	-23%	-118%
Bexley	100%	-1%	-26%	-169%	-2%	-170%	-214%
Ealing	100%	-39%	-1%	-135%	-279%	-169%	-587%
Haringey	100%	-52%	-54%	-19%	-461%	-56%	-734%
Bromley	100%	149%	220%	0%	32%	150%	205%
Newham	100%	153%	48%	871%	474%	2047%	2907%
Greenwich	100%	57%	79%	75%	289%	104%	392%
Enfield	100%	20%	0%	0%	105%	20%	166%
Brent	100%	9%	6%	21%	174%	30%	300%
Sutton	100%	0%	112%	0%	5%	0%	22%
Merton	100%	5%	102%	0%	60%	5%	144%
Havering	100%	0%	0%	90%	14%	90%	113%
Lewisham	100%	50%	119%	9%	122%	60%	208%
Redbridge	100%	7%	0%	203%	20%	226%	257%
Harrow	100%	0%	0%	0%	66%	0%	131%
Kingston upon Thames	100%	0%	13%	0%	6%	0%	12%
Hounslow	100%	3%	0%	3%	91%	6%	185%
Richmond upon Thames	100%	1%	0%	0%	27%	1%	34%
Hackney	100%	25%	11%	26%	56%	51%	184%
Southwark	100%	81%	49%	51%	290%	140%	495%
Lambeth	100%	24%	114%	18%	170%	41%	346%
Barnet	100%	1%	32%	0%	53%	1%	81%
Wandsworth	100%	10%	8%	3%	56%	12%	103%
Hammersmith and Fulham	100%	10%	13%	21%	79%	27%	117%
Hillingdon	100%	34%	34%	48%	42%	50%	60%
Kensington and Chelsea	100%	7%	19%	24%	97%	28%	158%
Islington	100%	5%	15%	12%	75%	16%	130%
Camden	100%	3%	11%	36%	97%	37%	173%
City of London	100%	1%	13%	9%	13%	11%	27%
Tower Hamlets	100%	16%	10%	52%	47%	75%	165%
Westminster	100%	2%	6%	23%	52%	25%	97%
Total	**100%**	**13%**	**23%**	**33%**	**79%**	**49%**	**166%**

Appendix A3 - Footnotes

[1] As given in GLA Economics Working Paper 11: Working London, Employment Projections by Sector, November 2004
[2] GLA, February 2004, The London Plan Spatial Development Strategy
[3] GLA Economics, January 2005, More residents, more jobs? The relationship between population, employment and accessibility in London
[4] GLA, 2004, Transport Accessibility: Case for London technical report 1, GLA
[5] GLA, 2004, Case for London, Technical Report, GLA
[6] Population and employment data by ward was provided by Volterra Consulting.
[7] GLA, 2004, Impact on Potential Employment and Population of Thames Gateway Boroughs of the Thames Gateway Bridge, GLA
[8] Cross London Rail Links, 2003, The Crossrail Business Case, Chapter 6, Cross London Rail Links
[9] Transport for London, 2001, Transport Statistics for London 2001, Chapter 6: Travel to Work, Transport for London
[10] This can be downloaded at: www.networkrail.co.uk/engineeringprojects/tl2k/tl2k.htm.